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Fertility Differentials Amongst Contraceptors and Non-Contraceptors in India

THE most commonly used method of assessing the demographic impact of various family planning programmes is to estimate the number of potential births averted because of the family planning programme. Now, in order to estimate the number of potential births averted due to the use of different methods of family planning some authors like Jain (1969), Venkatacharya and Das (1972) made an assumption that the age specific fertility rates of acceptors of contraception would be the same as that of general population. While some others like Lee and Isbister (1966) postulated that the age specific marital fertility rates of acceptors of IUCD would be higher in constant proportion (about 20 per cent) than that of general population. Agarwala (1968) also assumes the age specific fertility rates of sterilised couples to be 20 per cent higher than those of general population. Potter (1969) on the other hand, bases his calculation on the assumption that the fecundity of acceptors of IUCD for each age class is higher than that of the corresponding general population. Mauldin (1968) tries to justify the assumption that the fertility of acceptors is higher than that of non-acceptors on the ground that the later contains sterile and sub-fecund groups while the former consists mainly of highly fecund group. He further argues that because of their this characteristic of higher fecundity they may be accepting contraception.

Though several authors have postulated the fertility of Contraceptors to be higher than that of non-contraceptors there exist very few studies to give an empirical evidence in support of this fact. It is observed by Ross (1966) in a study in Taichung that acceptors of IUCD had recent fertility rates about 20 per cent higher than that of non-acceptors; while Chow (1968) in another study observed

that the fertility of IUD acceptors, before first acceptance, is 58 per cent higher than that of all married women in Taiwan in 1964. In Greater Bombay Fertility Survey (GBFS) Rele and Patankar (1969) found the fertility of sterilised couples to be about 42 per cent higher than that of non-contraceptors. It is also observed in this study that users of non-terminal methods have fertility about 15 per cent higher than that of non-contraceptors.

The extent of fertility differentials between contraceptors and non-contraceptors may not only be varying from one community to another but also between contraceptors of different types within the same community. This differential may also be visible between different age class and duration of marriage of contraceptors and non-contraceptors. The present paper attempts to bring evidence to bear on this question of existing differential fertility of contraceptors and non-contraceptors. Besides, fertility differential amongst users of terminal methods and users of non-terminal methods would also be studied.

Source Material

The data presented here are based on an all India Family Planning Survey conducted by the Operation Research Group, Baroda during the year 1970. This study covered a representative sample of all currently married couples in India with wife in the age group 15 to 44 years. A Multistage sample design was adopted for this study. The sample was drawn in the form of two independent interpenetrating sub-samples. A total size of 25366 currently married couples, with wife in the age group 15 to 44 years was covered in the sample. This sample size was drawn from 204 urban and 754 rural settlements spread all over the country.

Out of total currently married couples selected in the sample about 13.6 per cent reported to have been currently using one method or the other of birth control. A further breakup of the current users of birth control methods indicates that, of the 13.6 per cent of the current users, about 6.2 per cent of the cases were using terminal methods. The percentage of past users of some birth control methods was found to be around 4.6. Thus, in all about 18.2 per cent of couples reported to have used one method or the other.

Distribution of Ever-users of Contraception

Before we actually go into the analysis of differential fertility of contraceptors and non-contraceptors it is of interest to understand the distribution of ever-users of contraception.

TABLE 1—PERCENTAGE DISTRIBUTION OF EVER-USERS OF
CONTRACEPTION IN INDIA

<i>Type of method used</i>	<i>Terminal method ceptives</i>	<i>IUCD</i>	<i>Oral contra-</i>	<i>Conventional contraceptives</i>	<i>Non-appliance methods</i>
Percentage	32.63	6.34	3.04	22.37	35.62

As is evident from Table 1 the percentage of couples, who reported to have used non-appliance methods like Coitus interrupts, abstinence and rhythm, was the highest (35.62). Terminal methods (32.63 per cent) seem to be the next choice amongst the contraceptors. Third rank in order of preference of use of a method goes to conventional contraceptives; whereas oral contraceptives seem to be the least preferred method.

Fertility Differentials

Fertility differences among contraceptors and non-contraceptors are measured here by using the index of fertility as the average number of children everborn to women with different effective marriage duration. To arrive at a single index for comparison we standardise the average number of children everborn to non-contraceptors and to different types of contraceptors by using the over all distribution (as standard distribution) of all wives below 45 by effective marriage duration.

It is obvious from Table 2 that the standardised average number of children ever born per woman is 3.44 for never users. The corresponding figure for ever-users of birth control methods is however found to be 4.05. In the study of GBFS it is observed that the standardised average number of children ever bora to never users and ever users of contraception are 2.48 and 3.21 respectively. Thus, in the present study, the fertility of both non-contraceptors as well as contraceptors is found to be higher than the fertility of the corresponding groups in GBFS. Now, whether this difference in fertility in the respective groups of these two studies is spurious or real, naturally depends amongst other factors, upon the difference in the effective duration of marriage for which the women in these two studies may have been exposed. For this purpose fertility rates of never users as well as that of ever users in GBFS were standardised on the basis of the overall distribution of all wives below age 45 of the present study (to be taken as standard), and they are presented in Table 2. One could thus infer that the fertility of both 'never users' as well as 'ever users' as observed in the present study, is higher in general than that of the corresponding groups in GBFS; where-

TABLE 2—OBSERVED AND EXPECTED AVERAGE NUMBER OF LIVE BIRTHS BY DURATION OF MARRIAGE FOR (I) NEVER USERS (II) EVER USERS (III) USERS OF TERMINAL METHODS AND (IV) EVER USERS OF NON-TERMINAL METHODS IN INDIA

Effective marriage duration (in years)	Average no. of live births for								Distribution of Currently married women below 45(in 000's)**
	Never-users		Ever-users		Users of terminal method*		Ever users of non-terminal methods		
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected	
0-4	0.53	0.60	0.93	1.14	1.24*	1.34	0.94	1.01	21202
5-9	1.73	1.46	2.27	2.16	2.73	2.44	2.21	1.99	27719
10-14	3.06	2.85	3.71	3.52	4.12	3.82	3.52	3.36	32907
15-19	4.23	4.25	4.78	4.84	4.87	5.06	4.73	4.74	27045
20 +	5.36	5.36	6.09	6.09	6.15	6.15	6.06	6.06	52121
All durations	3.37		4.35		5.11		4.03		3.55
Total no. of couples (in 000's)	131505		29489		8555		20934		160994
Standardised+ average no. of live births of the present study	3.44		4.05		4.75++		3.98		3.55
Standardised+ average no. of live births of GBFS	2.99		3.77		4.73++		3.27		3.18

Estimated value from the graph.

** The projected women from the sample.

+ When the distribution of all the wives below 45 of the present study was considered as standard.

++ The standardised value excluding the marriage duration of 0-4 years for which the average not computed because of small number of sample in this category.

as the fertility of sterilised groups in both these studies, appears to be nearly the same. The obvious reason for the low fertility in GBFS could be due to the purely urban nature of this population, whereas the present study gives a combined picture of rural and urban fertility level on an all India basis.

A further analysis of the present study reveals that the overall fertility of ever-users in India is about 17.7 per cent higher than that of never users. Among the contraceptors, the fertility of users of terminal methods is 38.1 per cent higher than that of never users. However, the fertility of ever-users of non-terminal methods is around 15.7 per cent higher than that of 'never users'. Furthermore the extent of fertility differentials between users of terminal and non-terminal methods is found to be 19.4 per cent.

Fertility Patterns by Duration of Marriage

Now, in order to study fertility patterns for a couple in relation to duration of effective marriage it is felt necessary to smooth the average number of children everborn to women with different effective marriage duration by fitting suitable exponential curves separately for non-contraceptors as well as for ever-users of different contraceptions. Since the data for the average number of children ever born by duration of marriage followed j type curve and its first differences resemble a normal frequency curve it is attempted to fit logistic curve

$$y = k/1 + 10^{a-bx};$$

where y is considered to be the average number of children ever born to a woman of marriage duration x_t for the distribution of 'never users'; 'ever users'; 'users of terminal methods*' and 'ever users of non-terminal' methods respectively. The constants k , a and b of the three curves are obtained separately by using the method of three points selected so as to cover almost the entire range of observations (Croxtton and Cowden, 1966). In order to test the goodness of fit chi-square test is applied. The test justifies the choice of logistic curves¹ for all these distributions. The fitted and the observed distributions for all the groups excepting 'ever users', are shown in Fig. 1.

Table 2 also gives the fitted distributions of 'never users', 'ever users', 'users of terminal methods' and 'ever users of non-terminal methods'. The expected

1. The fitted logistic curves for distributions of 'never users', 'ever users', 'users of terminal methods' and 'users of non-terminal methods' are :

$$y = 5.74000/1 + 10^{0.69880-0.08232x}; \quad y = 6.78884/1 + 10^{0.51249-0.07277x}$$

$$y = 6.73620/1 + 10^{0.42276-0.07356x}; \quad \text{and} \quad y = 6.77737/1 + 10^{0.56855-0.07481x}$$

respectively.

average number of live births for women of marriage duration 20 years and over, is found to be 6.15 for users of terminal method, 6.06 for ever users of non-terminal methods and 5.36 for never users of contraception. Average num-

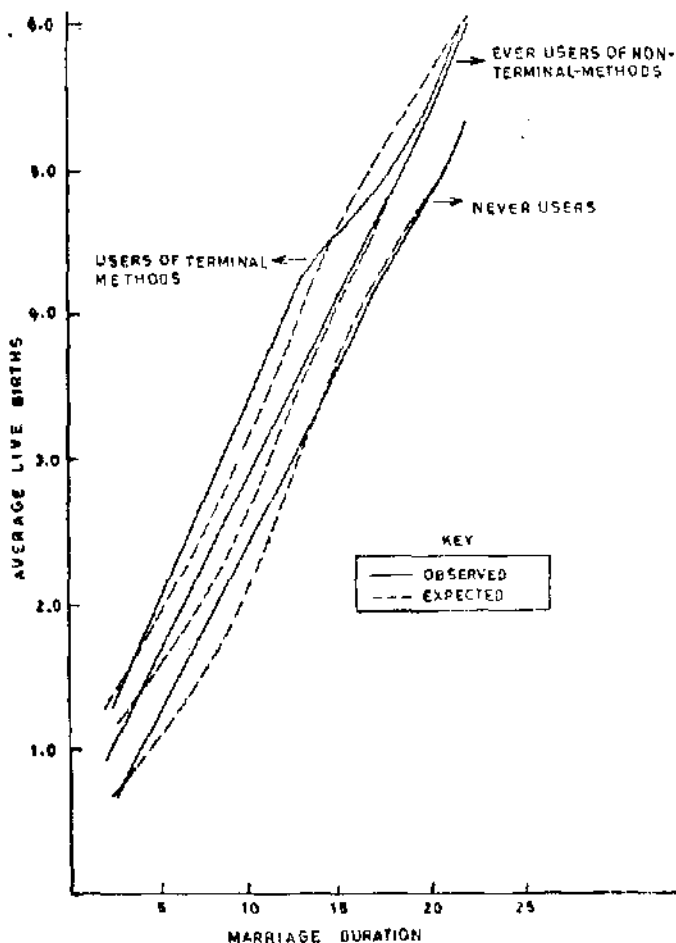


Fig. 1. Observed and expected average number of live births by marriage duration.

ber of children ever born in the case of users of terminal methods is the highest for all marriage durations while the average number of children ever born to never users of contraception for all marriage durations, is the lowest. Though the average number of children ever born is found to be higher, for all marriage durations, in the case of users of terminal methods than that of ever users of non-terminal methods, the average number of children ever born for marri-

age duration 20 and over is found to be almost the same in both the categories of these contraceptors,

It is obvious from Table 3 that the percentage fertility differences, by marriage duration, between 'users of terminal methods' and 'users of non-terminal methods' (Type III) has a tendency to decline with the increase in the duration

TABLE 3—PERCENTAGE FERTILITY DIFFERENCES BETWEEN, (I) NEVER USERS AND USERS OF TERMINAL METHODS, (II) NEVER USERS AND USERS OF NON-TERMINAL METHODS AND (III) USERS OF TERMINAL METHODS AND USERS OF NON-TERMINAL METHODS, BY MARRIAGE DURATION

Marriage duration	Percentage fertility difference between					
	Never users vs. users of terminal methods (Type I)		Never users vs. users of non-terminal methods (Type II)		Users of terminal methods vs. users of non-terminal methods (Type III)	
	A	B	A	B	A	B
0-4	121.52	121.41	67.55	67.74	32.31	32.18
5-9	67.3	66.91	36.42	35.81	23.13	22.26
10-14	33.95	34.59	17.85	18.40	13.81	13.71
15-19	18.88	19.02	11.47	11.63	6.64	7.18
20-24	14.92	14.47	11.99	11.61	2.44	2.65
25-29	15.03	15.16	14.25	14.26	0.41	0.13

A Differences computed using the average number of children ever born as estimated by logistic curves.

B A polynomial of an appropriate degree is fitted to (hscs (Col. A) differences and the fitted values are shown in this column.

of marriage. However, this trend was found to be valid upto marriage duration 20-24 in the case of Type I (Never users vs. Users of terminal methods) and upto marriage duration 15-19 in the case of Type II (Never users vs. Users of non-terminal methods).

Distributions of Type I to III when represented graphically in Fig. 2 suggests that the nature of relationship existing between the variables 'duration of marriage' and 'percentage fertility differences' is of the curvilinear Type. In what follows an attempt is being made to smooth these distributions of Type I to III by using a polynomial of appropriate degree.

A polynomial regression

$$y = A + A_1\varphi_1(x) + A_2\varphi_2(x) + A_3\varphi_3(x) + \dots$$

Where y is the percentage fertility difference for women of marriage duration x years, was fitted to a series of curtailed observations ($x < 30$) with equal intervals of x . And (X) is orthogonal polynomial of degree j .

The above equation can also be expressed as follows :

$$y = a_0 + a_1\varphi_1'(x) + a_2\varphi_2'(x) + a_3\varphi_3'(x) + \dots$$

where, $a_0 = \bar{y}$, $\varphi_j'(x) = \varphi_j(x) \lambda_j$ and $\varphi_1(x) = x - \bar{x}$ and the variables $\varphi_1(x)$, $\varphi_2(x)$, $\varphi_3(x) \dots$ are derived by the recurrence formula

$$\varphi_r(x) = \varphi_1'(x) \varphi_{r-1}(x) - \frac{(r-1)^2 [N^2 - (r-1)^2]}{4 [4(r-1)^2 - 1]} \varphi_{r-2}(x)$$

where N is the number of items in the series, r is the degree of polynomial under consideration and $\varphi_0(x) = 1$.

The process of determining the coefficients by successive addition of higher polynomial and also of testing the coefficients by analysis of variance is continued till a non-significant value of a coefficient was obtained (Venkatacharya and Das, 1972). It is found that an orthogonal polynomial of third degree provides a good fit to the curtailed distributions of type F and type II³, whereas the second degree polynomial provides a good fit to the curtailed distributions of type III⁴. The graphs of the fitted and the original values are shown in Fig. 2. The estimated percentage fertility differences for different durations of marriage are presented in Table 3,

Possible Reasons for Fertility Differences

Having established the existence of fertility differentials by contraceptive experience, it is of interest to enquire as to how these differentials have come about.

2. The fitted equation for Type I is:

$$y = 159.39506 - 16.56837 x + 0.62243 X^2 - 0.00766 x^3.$$

3. The fitted equation for **type II** is :

$$y = 90.36950 - 10.03630 x + 0.40704 x^2 - 0.00518 x^3.$$

4. The fitted equation for Type III is:

$$y = 38.83790 - 2.51201 x + 0.04016 x^2$$

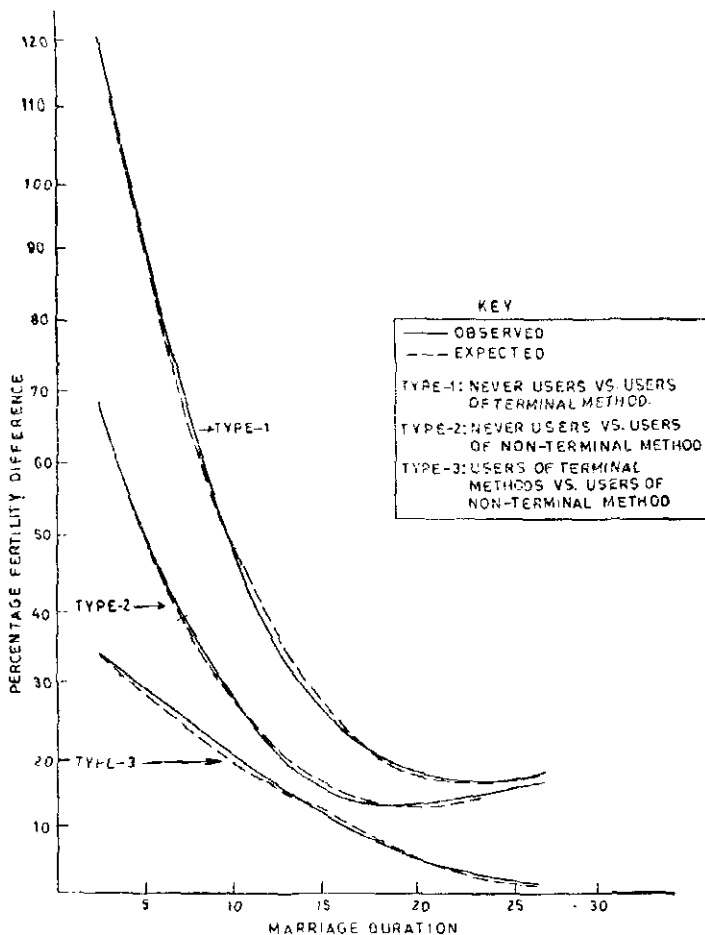


Fig. 2. Percentage fertility difference by marriage duration.

It is obvious from Table 4 that contraceptors themselves do not form an homogeneous group with respect to socio-economic status. Amongst the contraceptors ever-users of non-terminal methods seem to belong to higher socio-economic stratum of the population; whereas couples who do not resort to any contraception seem to belong to the lowest socio-economic stratum.

Thus though fertility of users of terminal methods is the highest, this group of couples only occupies an intermediate position as regards the socio-economic status. On the other hand, non-contraceptors whose fertility is the lowest belong to the lowest socio-economic group in comparison with contraceptors. Therefore it appears that socio-economic status of a couple may be acting as a

TABLE 4—SOCIO-ECONOMIC CHARACTERISTICS OF (1) NEVER USERS OF CONTRACEPTION; (2) USERS OF TERMINAL METHOD AND (3) EVER USERS OF NON-TERMINAL METHODS

Type of method used	Per cent couples with	
	Literate wife	Family income over Rs. 200 per month
Never users	15.9	20.9
Users of terminal methods	35.6	36.1
Ever users of non-terminal methods	45.6	43.6

secondary factor in the existence of fertility differentials amongst contraceptors and non-contraceptors.

It has been observed in a study (Gandotra and Bhanot, 1972) that the variable 'number of living children' acts as one of the major deciding factor in the acceptance of contraception. It has also been found in another study (Gandotra and Das, 1972) that the age at which one decides to go for sterilisation depends mainly on the fecundity component of the individual. Therefore the possible primary reasons as mentioned above for these fertility differentials between contraceptors and non-contraceptors could be due to the fact that non-contraceptors include the sub-fecund groups who have less need for contraceptions and are therefore less likely to accept the same. Contraceptors on the other hand seem to form a more fecund group, particularly the sterilized group, whose past high fertility may be a major motivation of their accepting contraception.

Table 5 shows that those who are using non-terminal methods have started using family planning methods comparatively earlier in their reproductive

TABLE 5—PRACTICE OF FAMILY PLANNING BY NUMBER OF LIVING CHILDREN

Categories of contraceptors	Percentage of couples with number of living children						Total
	None	1	2	3	4	5	
Terminal methods	1.00	1.94	10.64	19.87	23.48	43.07	100.00
Non-terminal methods	5.81	15.01	20.77	18.74	13.31	26.36	100.00

period. Nearly 42 per cent of those using non-terminal methods have started using family planning before having three living children. Terminal method seems to be acceptable to most of the couples only when they had at least two living children. Hence the fertility difference between the ever users of terminal

and non-terminal methods could partly be due to the fact, that couples with many children prefer to go for terminal methods to limit their family size while couples with relatively less number of children prefer non-terminal methods either for spacing or limiting. Another reason for the fertility differences in these two groups could be attributed to the difference in the socio-economic status of the two groups.

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References

1. **J, Jain, S. P.**, 1969, Estimation of population **growth** under family planning **programme**. *The Journal of Family Welfare*, XVI (1), 33-47.
2. Venkatacharaya, K. and Das, N., 1972, An application of Monte Carlo model (to estimate births averted due to various family planning methods. *Sankhya, The Indian Journal of Statistics, Series B*, 34(3), 297-310.
3. Lee, B. M. and Isbister, J.. The impact of birth control programmes on fertility. In: B. Berelson and others (eds.), *Family Planning and Population Programme*. Chicago, University of Chicago Press, pp. 747-755.
4. **Agrawala, S. N.**, 1968, How are we doing in family planning in **India ?** *Demography* 5(2), 710-713.
5. Potter, R. G., 1969, Estimating births averted in a family planning programme. In : S. J. Behramah, L.Corsa, and R. Freedman (eds.), *Fertility and Family Planning : A World Review*. Ann Arbor, University of Michigan Press, pp. 44.
6. Mauldin, W. P., 1968, Births averted by family planning programme. *Studies in Family Planning*, 33, 1-7.
7. Ross, John A., 1966, Cost of family planning programmes. In : Bernard *et al.* (eds.), *Family Planning and Population Programmes*. Chicago : The University of Chicago Press, pp. 761-772.
8. Chow, L. P., 1968, A study on the demographic impact of an IUD programme. *Population Studies*, XXII(3), 350.
9. Rele, J. R. and Patankar, T., 1969, Differential fertility of contraceptors and non-contraceptors. A paper presented in a General Conference organised by International Union for the Scientific Study of Population, London.
10. Operation Research Group, *An All India Survey of Family Planning Practices*. Sponsored by Ministry of Health and Family Planning, Nirodh Marketing Division. A report published by Operation Research Group, Baroda, India.

11. Croxton, F. E. and Cowden. D. J., 1966, *Applied General Statistics*, (2nd edn.). Prentice-Hall of India (Private) Ltd., New Delhi, pp. 310-316.
12. Fisher, R. A. and Yates, F., 1963, *Statistical Tables for Biological, Agricultural and Medical Research*, (6th edn.)- Oliver and Boyd, Edinburgh, pp. 33.
13. Gandotra, M. M. and Bhanot, I. V., 1972, *Demographic and Socio-Economic Correlates of Contraceptors in India*. Mimeographed, Demographic Research Centre, Baroda.
14. _____ and Das, N., 1972, A multivariate approach to study certain factors influencing the decision making age of adoption of sterilization. Published in the Proceedings of the Seminar on *Family Planning Problems in India*, Organised by UPS, Deonar, Bombay.