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On Measurement of Overall Impact of Family Planning Programme on Fertility Reduction

The object of the Family Planning Programme in India is to reduce the birth rate of about 42 per 1000 population obtaining in 1961 to a level of 25 per 1000 population by 1980-81. Various methods and contraceptive devices are being introduced for adoption and use, and these are being provided either at no cost or at highly subsidised rates. A network of services has been established throughout the country and regular service statistics are being collected aud compiled to assess the impact of the Programme. The two measures used for assessment of the programme are (i) number of births prevented and (ii) percentage of couples protected as a result of the family planning services. Fairly complicated and elaborate method has been suggested for calculating these measures. While the total number of births prevented gives an idea of the overall achievement of the services provided to the community, the percentage of couples protected at any point of time attempts to provide an idea of the extent of coverage of the aggregate of reproductive couples who have prevented additional births. Hopefully, the percentage of couples thus protected can be made to throw some light on the amount of success achieved in checking the birth rate in the country. The present note considers the question: Is it possible to get an idea of the extent of birth rate reduction from such an index of percentage of couples protected It seeks to show that for measuring the extent of birth rate reduction correctly it is necessary to use a more sensitive indicator than the currently used index of couples protected.

Let N_t be the number of reproductive couples at time t. The fertility of individual couples depends on a number of factors; some of them may even be sterile. A few of the socio-economic and demographic variables which are known to affect the fertility rate are age, parity, level of education, level of income, religion, rural-urban residence etc. Hence it is useful to consider variation in fertility according to such stratification variables.

Let the total number of reproductive couples be classified into k homogeneous socio-economic-demographic groups and the number of couples belonging to the i-th group be denoted by N_{it} ($i = 1 \ldots\ldots\ldots, k$). It should be noted that k, the total number of such homogeneous groups will normally be quite large since for each of the characteristics cited above a number of classes will have to be chosen to take into account the differential fertility behaviour among different types of reproductive couples. Thus if 6 age-groups, 6 parity groups, 6 levels of education, 6 income groups, 4 religious groups and 6 types of residential status are considered the number of homogeneous groups will run into more than 30 thousand (more precisely 31,104). To get the fertility rate specific to each such homogeneous socio-economic-demographic group one will require huge mass of data. However, we would stress that from practical considerations only a few variables like age, religion and residential status need alone be taken into account for deriving the new measure being recommended in this paper for adoption. Accordingly, k may represent a reasonably small number.

For estimating the birth rate reduction it will be useful to enumerate all the couples n_{it} (out of N_{it} couples) who have been protected against risk of pregnancy at time t. Estimation of N_{it} and n_{it} at any point of time might be quite difficult unless reasonably good estimates of these two numbers N_{i0} and n_{i0} for some base period o close to time t are available from some recent field survey. The attrition rates due to various causes have to be taken into account to determine the numbers N_{it} and n_{it} from the base line figures.

The number n_{it} will have to be calculated by taking contraceptors of different family planning methods into account. While for the sterilised persons the protection against the risk of conception is complete, for the IUCD acceptors and users of other contraceptive methods, it is partial to a varying degree. Although IUCD is a semi-permanent method, its retention rate and use-effectiveness vary considerably due to various factors - death, removal, expulsion or pregnancy. The protection provided through use of conventional contraceptives like condoms, diaphragm, jelly, foam tablets, pills etc. lasts only during the period of their use and for most of these contraceptive devices the use-effectiveness (except perhaps for oral pills) is appreciably low. These factors will have to be suitably taken into account to derive a reasonably good estimate of n_{it} at any point of time t.

The next step is to determine the specific fertility rates of N_{it} and n_{it} couples for the i-th socio-economic-demographic group ($i = 1, \ldots\ldots k$) at time in the absence of protection. Let these fertility rates be denoted by F_{it} and f_{it} respectively. The total number of births conceived at time t will obviously be given by

$$N_{it} \; F_{it} \tag{1}$$

to which the contribution of n_{it} couples would have been

$$n_{it} \; f_{it} \tag{2}$$

Thus $n_{it} \; f_{it}$ births out of the possible $N_{it} \; F_{it}$ births at time t will have been prevented when n_{it} out of N_{it} couples are protected against the risk of conception at time t.

The extent of birth rate reduction will then be provided by

$$\frac{n_{it} f_{it}}{N_{it} F_{it}} \times 100 \tag{3}$$

Thus the overall percentage reduction in birth rate by all the socio-economic-demographic groups will be given by

$$\frac{\sum_{i=1}^{k} n_{it} f_{it}}{\sum_{i=1}^{k} N_{it} F_{it}} \times 100 \tag{4}$$

Since we are assuming that N_{it} couples constitute a homogeneous group having a common fertility rate it may not be unreasonable to assume $F_{it} = f_{it}$ (i = 1,..............k). However, if on account of practical difficulties the socio-economic-demographic classification is not sufficiently detailed, the N_{it} couples may not be quite homogeneous in their fertility rates and the expression (4) will be more appropriate to use in such situations. For instance, if only age of contraceptors is used for determining the demographic groups N_{it}, it will be more reasonable to assume in this case that f_{it} F_{it}, since besides age, many other socio-economic factors like parity, religion, rural-urban residence may have significant impact on fertility. In fact it is often held that acceptors of family planning programme are more fertile than an average reproductive couple.

For the present analysis, therefore, we shall assume $f_{it} \neq F_{it}$ for i = 1,...........k.
If in the expression (4) $F_{it} = f_{it} = f_t$ for i = 1,......k. then the extent of birth rate reduction works out to

$$\frac{\sum_{i=1}^{k} n_{it}}{\sum_{i=1}^{k} N_{it}} \times 100 \tag{5}$$

The expressions (4) and (5) will also be equal when

$$\frac{\sum_{i=1}^{k} n_{it} f_{it}}{\sum_{i=1}^{k} N_{it}} = \frac{\sum_{i=1}^{k} N_{it} F_{it}}{\sum_{i=1}^{k} N_{it}} \tag{6}$$

i.e. when the general fertility rate of the family planning acceptors at time t is identical with the average fertility rate obtaining in the general population; or, in other words, when the acceptors of family planning programme constitute a truly representative sample of the general population. Such an assumption will obviously hold good in practice only on rare occasions.

As mentioned earlier, estimates of n_{it} and N_{it} are to be obtained from some base line field survey data. Similar is the case with estimates of f_{it} and F_{it}.

For getting a reasonably good approximation to the expression (4), it may be desirable to study the relationship among f_{it}'s and F_{it}'s for $i = 1,\ldots\ldots\ldots k$. If one of these k groups, say $i = k$, is taken as the base or standard (for instance, the group which shows the highest fertility) then the base line data at time o may throw some light on the aforesaid relationship at time o. If it is observed that for time $t = o$,

$$F_{i0} = \alpha_i F_{k0},\ i = 1,2,\ldots\ldots\ldots k; \tag{7}$$

it will not be unrealistic to assume that

$$F_{it} = \alpha_i F_{kt},\ i = 1,2,\ldots\ldots\ldots k; \tag{8}$$

especially when the base line field data are fairly recent. Likewise, it may be not unreasonable to assume that

$$f_{it} = \alpha_i f_{kt},\ i = 1,2,\ldots\ldots\ldots k; \qquad \alpha_k = 1$$

It should also be possible to derive some relationship between f_{kt} and F_{kt} on the basis of some field study of the fertility rates of certain specific groups of acceptors and non-acceptors of the family planning programme. If

$$f_{kt} = \beta_t F_{kt} \tag{9}$$

an estimate of β_o may be derived for the base line period from bench mark field survey data. Normally β_t can perhaps be assumed to be equal to β_o whenever t is not very far away from the base year.

Under these assumptions the expression (4) will reduce to

$$\frac{\sum_{i=1}^{k} \alpha_i n_{it}}{\sum_{i=1}^{k} \alpha_i N_{it}} \alpha_o .100 \tag{10}$$

The weights $(\alpha_1,\ldots\ldots\ldots,\alpha_k)$ could be used to convert the couples in different age groups into 'standard couples' belonging to some specific age-group. The number of reproductive couples in the i-th group has to be multiplied by α_i (which measures the relative fertility rate of the i-th group as against a standard group k defined more or less heuristically) to get the total number of 'standard couples'.

The ratio

$$\frac{\sum_{i=1}^{k} \alpha_i n_{it}}{\sum_{i=1}^{k} \alpha_i N_{it}} X\ 100 \qquad (11)$$

will thus indicate, the percentage of 'standard couples' who have been protected against the risk of conception at time t.

By multiplying this percentage of 'standard couples' protected by an inflation factor β_O depending on the relative fertility of the family planning acceptors vis-a-vis non-acceptors of the programme, one will get the experssion (10) above which is expected to provide a reasonably good estimate of the extent of birth rate reduction on account of the family planning programme at any point of time t. The adjustment factor β_0 should normally be not much different from 1; consequently the percentage of standard couples protected as shown in expression (11) is likely to provide a first approximation to the extent of birth rate reduction.

Form the above analysis it is obvious that base-line survey data are crucial for deriving estimates of not only the unknown parameters a_i i=1,.........k and β_0 but also of N*it* from NW. The number of reproductive couples N*it* in the i-th group can be estimated from N*io* reasonably well only for a few socio-economic-demographic variables. The rate of population growth for the i = th group will have to be ascertained from the past population data. For any specific age group, the change that takes place with time will be fairly easy to decide. Similar is the case perhaps with the residential status since the rate of urbanisation has so far been fairly slow ; the size of the rural-urban population at time may therefore be estimated reasonably well from the base line rural-urban structure. Religion-wise distribution may also be fairly stable provide large scale conversion from one religion to the other does not occur. Educational composition and income distribution of the population, subject to substantial internal mobility from one area to the other, may be rather difficult to estimate from the baseline data on the related characteristics.

Thus on practical considerations, it appears that standard couples can be defined in terms of only a few characteristics like age, religion and residential status of couples. For instance, a couple belonging to the most fertile age group 20-24, Hindu in religion and residing in a rural •area may be defined as the standard couple ; the relative fertility of couples belonging to another age group, religion and an urban area, can be utilised for converting couples with different demographic and social characteristics into more homogeneous groups of standard couples as defined under expression (ii). Unless the area under study is quite wide, the extent of variation in religious composition and the degree of internal mobility may be insignificant. As such, for universal application it may be advisable that only age specific fertility rates may be used for deriving the percentage of 'standard couples protected'. We have illustrated the method of derivation of percentage of standard fertility rates in an earlier paper.[1] In that paper available data were used to derive an alternative measure of birth rate reduction using the modified concept of percentage of standard couples protected. It was shown there that use of the normal concept of percentage couples protected may lead to considerable upward bias in estimating the extent of reduction of the overall birth rate. The alternative estimate of birth rate reduction had to be worked out there on rather arbitrary assumptions due to lack of requisite data on various parameters used in the present analysis. It should be worthwhile to work out the modified indicator of percentage of standard couples protected for estimating more reliably the extent of birth rate reduction achieved in a country from time to time.

1. Views expressed in this article need not necessarily be those of the Government.

2. "On Method of Assessment of Overall Impact of Family Planning Programme on Fertility"—Dr. K.C. Seal & N.K. Bhatnagar—Presented at the Regional Seminar on Demographic Aspects of Family Planning (Southern Region), Demographic Research Centre, Dharwar, March 1972.