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Analysis of Fertility Decline in India Through Weighted Path Analysis

THE family planning programme in India dates back to 1952, when the Government of India was the first to recognise the implication of unchecked population growth. Till 1966, the programme was clinical in nature. People were expected to come to the clinics for information and services. The major emphasis was on sterilisations which were carried out only in a few clinics situated mostly in urban areas. During the third five-year plan, the programme was placed on a much firmer footing and the strategy was modified and reorganised from the limited clinical approach to one of extension education approach involving intensive education, publicity and bringing services near the doorstep.

Since inception, several approaches and schemes meant for improving acceptance have been tried. These included clinical approach, extension education approach, mass camp approach, integrated health and family planning approach. Certain limitations have, however, been observed in the programme performance. Successes that were initially recorded could not be sustained for a long time. Birth rate showed a decline from 41.7 to 33 but remained stagnant around 33 since 1977, though the couple protection rate has been going up. Hence there is a need to look carefully at the family planning programme performance of various states and assess the quantum of fertility decline together with the conditions responsible for it. Some work in this direction has been done by Srinivasan, Pathak, Jain, Adlakha and Arora. There is also a need to study the factors associated with fertility decline experienced so far and the role played by factors such as development, family planning efforts and also the interaction between them. The present study has been undertaken to assess the conditions of fertility decline and to disentangle the effects of family planning efforts and development efforts, through weighted path analysis.

Material and Methods

Path analysis is a multivariate technique which provides estimate of direct as well as indirect effects of several independent variables on the dependent variable. This study was undertaken to assess the direct and indirect contributions of development and family planning efforts on fertility decline. Data have been taken for the 16 variables from family welfare yearbooks for the different years and from census publications for 1971 and 1981. The data used relate to demographic variables, family planning variables and some aspects

of development for different states for 1971 and 1981. The 16 variables considered were crude birth rate (CBR), couple protection achieved (CPA), percentage of women married, infant mortality rate (IMR), percentage of urban population and percentage of female literacy, crude death rate (CDR), age at marriage, population density, expectation of life at birth, total fertility rate (TFR), sex ratio, percentage of women employed, number of PHCs, staff in position and beds per 1,000 population. The state of India has been taken as the unit of analysis. Data were used for the 22 states. Two types of path analysis have been undertaken, namely simple and weighted. In the weighted path analysis the states were given due weights in proportion to their respective populations. There is considerable difference in the population count. Weighting has been done as the states are of very different size. The population of Uttar Pradesh was 110.9 million and that of Nagaland was 0.8 million as per the 1981 census.

Both simple as well as weighted path analysis have been attempted for 1971 and 1981. Analysis has been done at two points in time with a view to know the changes which have taken place in the path coefficients and their explanatory powers during the decade and their implications for programme execution.

Basic theorem of path analysis has been used for calculating path coefficients. This can be written as follows:

$$r_{ij} = s \sum_{q} p_{iq} \cdot r_{jq}$$

here i and j are two variables and q runs over all the variables which have paths leading directly to variable i . r_{ij} is the correlation coefficient between i^{th} and j^{th} variable, r_{jq} between j^{th} and q^{th} variable and p_{iq} is the path coefficient between i^{th} and q^{th} variable.

Results and Discussion

For path analysis (simple as well as weighted) CBR has been taken as the dependent variable, which measures fertility. Couple protection achieved has been taken as the intermediate variable. All the independent variables have been clubbed into two categories, namely developmental and FP efforts. Data on these variables have been taken for 1971 and 1981 and often for the later year as and when available.

First, step-wise regression analysis was attempted to identify the significant determinants. Through this the significant variables observed were female literacy, IMR, urbanisation and percentage of women married. In addition CPA was included in the model as indicated by population theory. After this, path analysis, which is a kind of causal analysis, was used to estimate the direct and indirect effects of these four variables on CPA and in turn on CBR together with CPA.

Table 1 gives direct path coefficients for CBR for 1971, and 1981, and simple and weighted path analysis. For the 1971 weighted path analysis the highest path coefficient was 0.965 for IMR, followed by percentage of urban population as - 0.403 and by percentage of women married as 0.309. Least weighted direct path coefficient was for female literacy and was 0.028. This was preceded by CPA had which a path coefficient of 0.112. These coefficients are the quantum of changes taking place in the dependent variable for a unit

TABLE 1 : DIRECT EFFECT ON CBR

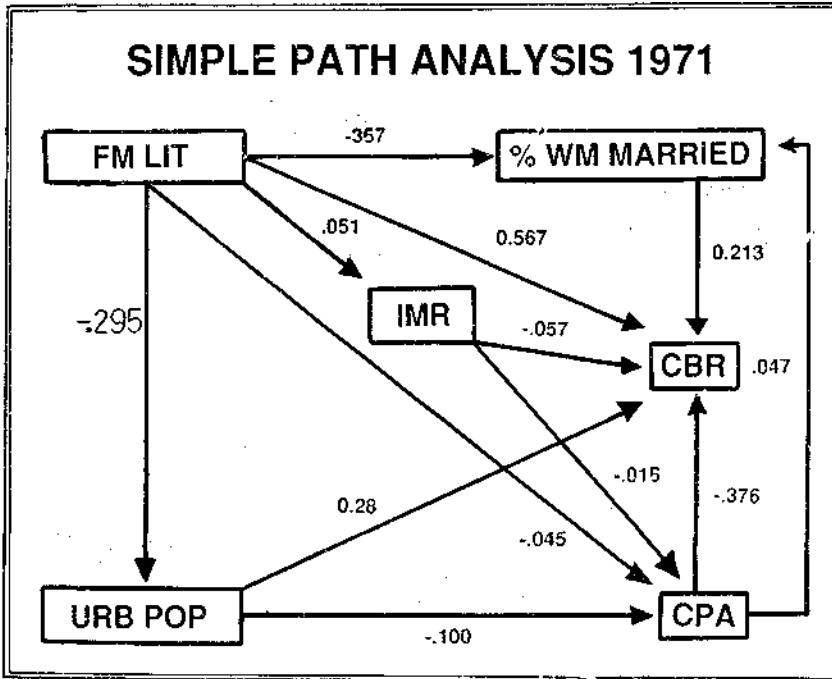
<i>Un weighted</i>		<i>Variables</i>	<i>Weighted</i>	
<i>1971</i>	<i>1981</i>		<i>1971</i>	<i>1981</i>
-.057	.322	IMR	.965	.600
.213	.419	%WM	.309	.401
-.376	.201	CPA	.112	-.640
-.567	-.338	FMLIT	.028	-.075
.28	-.528	URBPOP	-.403	-.458

change in the independent variable, other variables being kept constant. Essentially similar ordering of female literacy and CPA were seen for 1981. Path coefficients were, however slightly higher for 1981 than 1971. For simple path analysis in 1971 the highest path coefficient was observed for female literacy as -0.567 and the least for IMR as -0.057. CPA had a coefficient of -0.376. The results for the 1981 simple path analysis indicate that the coefficients were higher for 1981 than for 1971.

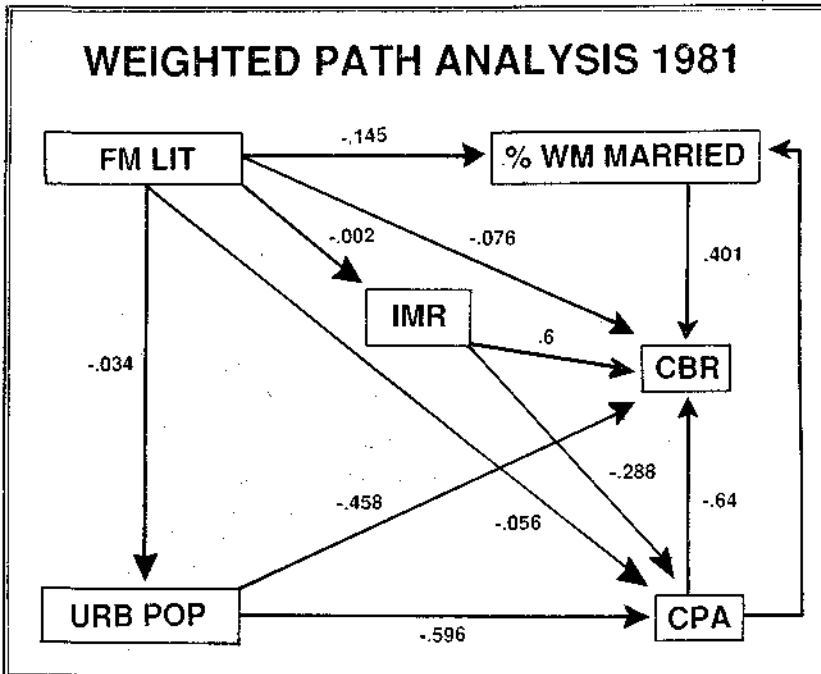
TABLE 2 : INDIRECT EFFECT ON CBR

<i>Unweighted</i>		<i>Variables</i>	<i>Weighted</i>	
<i>1971</i>	<i>1981</i>		<i>1971</i>	<i>1981</i>
-.076	-.065	FMLIT X %WM	.005	-.058
-.003	.087	FMLIT X IMR	-.016	-.001
.038	.055	URB POP X CPA	-.016	.381
-.083	.050	FMLIT X URBPOP	-.006	.016
.017	-.022	FMLIT X CPA	.001	.036
.217	.279		.044	.492

Table 2 gives indirect effects of the variables on CBR. Indirect effects were higher for 1981 and for weighted path analysis. This means that there was higher explanatory power for 1981, R being 0.71 for simple and 0.85 for weighted path analysis. This was because of additional explanatory power of the family planning efforts. The highest indirect path coefficients were for the percentage of urban population through CPA and for the 1981 weighted path analysis 0.381. Female literacy had the highest indirect effects through all variables considered namely IMR, percentage of women married, percentage of urban population and CPA. So it is the most significant variable which can be manipulated for a



Path Diagram 1.



Path Diagram 2.

substantial decline in fertility. A raise in female literacy would lead to a better status of women and this in turn would bring about changes in percentage of married women, CPA which would be consistent with a decline in marital fertility. For any decline in fertility, marital fertility must decline.

For understanding the differentials between weighted and simple path analysis, two path diagrams for simple 1971 and weighted 1981 indicating direct and indirect effects on CBR have also been shown.

From this path analysis model, it seems that the decline in fertility is possible by manipulating three variables namely IMR, female literacy, percentage of urban population. And they influence CBR through CPA and percentage of married women. It is quite possible that all these variables are causally related to CBR. Percentage still married women determines the target population for fertility. IMR, female literacy and percentage of urban population are measures of health status, women's status and economic development respectively of the area. They all affect the number of children desired by the women. If female literacy is higher, there is every possibility that the number of children desired would be around two and this would definitely be achieved through a regular and consistent use of contraception. This would also ensure a quality of the programme in terms of early acceptance of a family planning device.

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