AN ANALYSIS OF PROCESS OF ADOPTION OF CONVENTIONAL METHODS OF FAMILY PLANNING BY MALE INDUSTRIAL WORKERS IN TWO FACTORIES IN INDIA**

VICTOR JESUDASON*

INTRODUCTION

The population control programme has become a part of the national life in India. In fact, the first Government operated family planning clinic in the world was established in India in the year 1930. Alarmed at the population growth revealed in the Census of 1961, an all-out effort at population control was adopted as the official policy of the Government of India in 1963 (Schramm, 1971:17). Perhaps, very few countries in the world have as elaborate machinery (both official and voluntary) devoted to population control as India has. In spite of all these, Chandrasekhar when analysing 1971 census data reports that, the family planning programme has not yet made any considerable dent on the growth of population (Census of India, 1971:36). It is beyond the scope of this paper to examine the manifold ramifications of unchecked/uncontrolled population growth on the economic and social development — in short, the "quality of life" — in the country. It is sufficient to assert that the present rate of growth of population should be reduced.

Perhaps, the policies so far adopted by the Government to popularise family planning need to be modified or radically changed. Towards this, social science research should examine in detail the dynamic process of adoption of family planning methods and then suggest new directions. Such an effort may provide policy makers and social planners the needed mechanisms by which population growth may be reduced.

PROBLEM

The governmental programmes advocating family planning, by and large, rely on persuasion and propaganda. The fundamental assumption of such an approach is that human beings are rational and they can rationally come to a decision regarding adoption of family planning methods.

The family planning techniques propagated by the Government of India can be classified under two headings. They are: (i) terminal methods (vasectomy and tubectomy), and (ii) conventional contraceptives (condom, IUCD, jelly, pills, etc.) (The latter methods are usually advocated for spacing of children. But they can be, and are, used by a few who do not want any more children). Between these two types of methods, the policy of the Government is to' give greater emphasis to the former than the latter.

* Dr. Victor Jesudason is Research Associate, Council for Social Development, New Delhi.

**The data for this paper were collected under the auspices of a research grant from the Godrej Trust. Shalini Bhogle collected the data and prepared the initial report. We are happy to acknowledge the computational facilities of the Computer Centre of the Delhi University. Our thanks are due to K. Satyanandam for computational assistance and to B. R. Patil and Prodipto Roy who critically read earlier drafts of this paper. Grateful acknowledgement is made to a referee of this journal whose critical reading and suggestions have greatly improved the paper.

A few studies have shown that some "irrational" elements are involved in the adoption of terminal methods. We define "irrational" behaviour as one that will not be adopted or subscribed to by majority of members in a society. In a follow-up study of those who underwent vasectomy in Tamil Nadu, it is reported that 18 per cent had fewer than three children, one per cent were over fifty years of age and three had no children at all (Repetto, 1968). In another study done in Mysore State, 28.5 per cent of the men vasectomized had fewer than three children, 17.6 per cent were fifty or more years of age, 78 had no children at all and 23 were not even married (Quoted in Repetto, 1968). Rationally one would not expect these people to undergo sterilization. Unless social science research explicitly takes these "irrational" elements into account, it will not be able to describe or predict adoption of terminal family planning methods. On the other hand, adoption of conventional contraceptive methods may not have such irrational elements. So, a generalized description of the process of adoption common for both the methods may mask many interesting and important differences.

The adoption of family planning methods, perhaps, is not a simplistic process. Simultaneous influence of many variables is involved. So, an univariate approach — an approach in which only one variable at a time is related to adoption of family planning methods, may be hopelessly inadequate. Only a multivariate approach can capture the dynamic process involved.

OBJECTIVES OF THE STUDY

The major objective of this paper is to examine the process by which male workers in factories adopt conventional contraceptives for family planning purposes. Specifically, the objectives are:

(1) to examine the role of background factors like education, income and age for adoption of family planning practices;
(2) to examine the role of mass media, as indexed by frequency of reading newspapers, in the process of adoption of family planning practices; and
(3) to examine the role of awareness of small family norm, as indexed by respondents' stated ideal family size, in this process.

DATA

During May 1969-February 1970, from among the workers who were married and living with their wives, a stratified random sample of unskilled, semi-skilled and skilled workers in two factories (namely, Godrej Factory, Bombay and Vazir Sultan Tobacco Factory, Hyderabad) was drawn. (See: Bhogle and Kaur, 1972:6-7 for further details regarding sampling). The two factories may be thought of as at two ends of a continuum regarding skill required and labour force commitment.[1] On the assumption that the process of adoption of family planning differs from men to women, only male respondents are included in this study. If for a respondent we do not have information on any one of the variables that is of interest to us, that respondent is

[1] On the possibility that the process of adoption of family planning practices may differ between the workers in the two factories, initial analysis was carried out for these two factories separately. We found that they do not differ and a few differences we noted were uninterpretable. So we have decided to ignore the differences between the two factories and treat the sample as if it is from the same population.

excluded for this analysis. Percentage distributions, means and standard deviations were computed for both the original sample (N=500) and the reduced sample (N = 449). We find that both the samples are similar and no detectable bias is introduced by eliminating from analysis those respondents with missing information.

VARIABLES

The major concern of this paper is the process by which factory workers come to adopt conventional family planning practices. In order to measure the degree of *adoption of family planning practices* (which is our major dependent variable) a series of questions relating to awareness and use of contraceptives were asked. The responses are coded as: never heard about conventional contraceptives = 0; heard, but never used conventional contraceptives = 1; and using/used conventional contraceptives = 2.

Any study in family planning will be incomplete if it fails to take into consideration certain demographic characteristics of the population that are of interest. Since our sample, by definition, excludes those who were unmarried / widowed, and those who did not have their wives living with them, only *age* of the respondent is included in this paper. It is coded in completed years. Among many variables which measure the location of an individual in the stratification hierarchy, we have selected the *level of education* attained by the respondent (coded in years of schooling completed) and *average monthly income* (coded in rupees). Presumably, the latter includes salary, wages for overtime work and income from other sources.

Since some studies have shown that mass communication media have an important part to play in the adoption of family planning practices, the degree of exposure to mass communication media is measured by the stated per week *frequency of newspaper reading* of the respondent. It is coded as: does not read — 0; reads less than once a week = l; reads at least once a week = 2; reads three or four times a week — 3; and reads daily = 4. In order to measure the respondents' *attitude towards family size,* they were asked: "In your opinion, ideally how many children a couple should have?" The responses are coded in number of children one ideally should have.

We have six variables: two related to socio-economic status, one indicator of demographic characteristic, one mass communication variable, one attitude variable and one adoption of family planning , variable.

A CAUSAL MODEL

The review of literature given elsewhere (Krishnamurthy, 1968; Agarwala, 1962; Rao, n.d.) shows that many studies have been conducted on adoption of family planning practices. We assume that adoption of family planning practice is an ongoing process. Hence, a model that treats adoption of family planning as an ongoing process might facilitate interpretation of the relationship among variables. For this purpose, the technique of path model is used here. This technique was developed by the genetist Sewell Wright (1934) and introduced into sociology by Duncan (1966). The technique is explained and discussed in several recent papers (Land, 1969; Heise, 1969) and numerous applications have appeared (Sewell and Shah, 1968: Shah, *et al,* 1971; Hauser, 1972). So elaborate discussion about the technique in this paper is unnecessary.

The model assumes that the relationship among the variables are linear and additive. The model is written as a set of

structural equations that represent the causal process assumed to operate among the variables that are taken up for consideration. From the structural equations, the population parameters can be estimated, and if found necessary, the model may be reformulated.

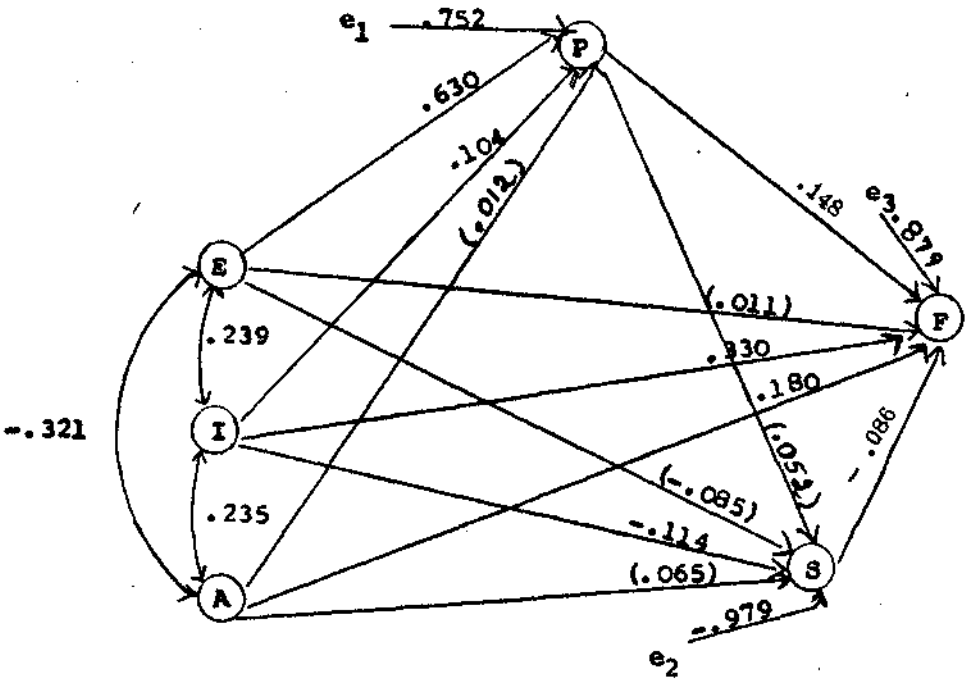
A CAUSAL MODEL OF THE PROCESS OF ADOPTION OF CONVENTIONAL METHODS OF FAMILY PLANNING

The variables that are of interest to us (listed above) can be divided into two categories, viz., exogenous and endogenous. Exogenous variables are those which are determined by variables outside the model. The exogenous variables may or may not be related among themselves. The association among them is taken for granted, and their influence on endogenous variables is of interest to us. Variables which the model is designed to explain are endogenous variables.

We take that the educational level attained by the factory worker (E), average monthly income (I) and age (A) are exogenous variables, and that they are associated among themselves. We hypothesize that these three demographic and social background factors influence the frequency of newspaper reading (P) of the respondent. It is reasonable to assume that among those who have the same level of income and age, higher level of education will positively determine the frequency of newspaper reading. It is also reasonable to assume that among those who have the same level of education and age, higher the income, greater the frequency of newspaper reading, as the structural barrier (lack of finance) will be absent. We also hypothesize that given the same level of education and income, age influences the frequency of newspaper reading. Unfortunately, we are not able to predict the direction of the relationship. It is possible that as people become more mature they will take time to read newspapers. If so, age will be *positively* related to newspaper reading. On the other hand, perhaps, most people of the older generation did not have an opportunity to develop the habit of reading newspapers in their formative years due to the low level of development of communication media at that time. If so, age will be *negatively* related to newspaper reading. It is possible that both may be operating and one may cancel the influence of the other.

We hypothesize that among those who have the same level of ("holding constant", or "net of") income, age and newspaper reading, higher the level of education, their concept of ideal family size will be smaller. Holding constant education (E), age (A) and newspaper reading (P), higher the income (I), smaller the family size norm (S) endorsed. Higher the income level of the people, greater will be the concern for consumer goods and comforts. In order to maintain a high standard of living, many people would opt for a small family. Further, higher the level of income, greater will be their assurance that they will be able to provide necessary, nutritional and health care to their children. This will give them the assurance that all their children will be alive when the parents reach old age. So, they may not feel the necessity to wish for more number of children. On the other hand, the older respondents were forming families at a time when the concept of small family was not actively popularized by the government. So, perhaps they produced large families. Having produced large families, perhaps, they adjusted their ideal to the real situation. So, it is possible that higher the age, larger their ideal family size. Net of education, income and age, we hypothesize that higher the frequency of newspaper reading, smaller

FIGURE 1 : A hypothesized model of the process of adoption of conventional contraceptives for family planning purposes: Male industrial workers in two factories.



NOTE : Variables are: E-education; I-income; A-age; S-ideal family size; P-newspaper reading; F-adoption of family planning. Figures within parentheses are not significant at .05 level.

the ideal family size. In view of the fact that the small family ideal is popularized through mass media by the government and other agencies, this hypothesis is justified.

We hypothesize that the location of an individual in the stratification hierarchy, as indexed by education and income, influences adoption of conventional methods of family planning. We expect this influence to be positive. The assumption underlying this assertion is as follows: higher the location in the stratification, greater the control over environment, and adoption of family planning practices is one indicator of such control.

It is possible that older respondents would have had a chance to "complete" their families. So we assume, older the respondents, higher will be their adoption rate. We also assume that frequency of newspaper reading and ideal family size intervene between background factors and adoption of family planning techniques. The former will be positively related and the latter negatively related.

In our model we conceptualize newspaper reading (P) and ideal family size (S) as causally prior to adoption of family planning practices, and among P and S, P as prior to S. It should be pointed out that all these three variables were measured at the same time and so one cannot attribute temporal priority of one over the other. One could argue that the habit of reading newspapers and ideal family size are rela-

tively stable indicators, at least in the short run, of already established norms. As such, we explicitly assume that they are causally prior to adoption of family planning practices. Between the frequency of newspaper reading and the concept of ideal family size, we assert that the former requires more time and energy to develop than the latter. Further, the mass media campaign to popularize small family is based on the assumption that mass media can influence the formation of the concept about the size of the family. So, for the following analysis it is assumed that newspaper reading is causally prior to forming a stable concept about ideal family size.

Figure 1 is a heuristic device to depict the causal relationships among various variables under consideration, which are verbally expressed above. The curved two-headed arrows indicate the unanalysed relationships among the exogenous variables, E, I and A. The straight unidirectional arrows symbolize direct causal influences. Since path analytic technique requires that the system be completely determined, the influences of unanalysed variables, departures from linearity and additivity and random disturbances are indicated by "e".

The model as formulated verbally and represented diagrammatically can also be rendered algebraically as a set of linear equations. Using the notation of path analysis, we denote the direct effect of variable k on variable j by Pjk and all the variables are expressed in standard form. The equations for the model in Figure 1 can be written as:

$$P = p_{PE}E + p_{PI}I + p_{PA}A + p_{pe_1}e_1 \quad (1)$$

$$S = p_{SE}E + p_{SI}I + p_{SA}A + p_{SP}P + p_{se_2}e_2 \quad (2)$$

$$F = p_{FE}E + p_{FI}I + p_{FA}A + p_{FP}P + p_{FS}S + p_{Fe_3}e_3 \quad (3)$$

where the disturbances, ej are taken to be mutually uncorrelated and uncorrelated with regressors in their own and preceding equations. We assume that the relationships among the variables are asymmetrical, linear and additive and estimate the model by least squares.

INTERPRETATION OF THE EQUATIONS — AN ILLUSTRATION

The interpretation of the equations is fairly straightforward. In the first equation in Table 2 (for example), for a unit (standard deviation) change in education (E) there is on the average, a change of P_{PE} in newspaper reading (P), net of the effects of income (I) and age (A). The numerical calculations are presented in Table 2, line 1. It shows that one standard deviation (4.027 years of education. Table 1) shift in education produces 0.630 standard deviation [or (.630) (1.602) = 1.009] change in newspaper reading, net of influences of I and A. Similarly, a one standard deviation change in I (or Rs. 131.423, Table 1) produces 0.104 standard deviation [or (.104) (1.602) = 0.167] change in newspaper reading, net of I and A. Although E and I are in different metrics — one in years of education and the other in rupees — since they are standardized, their effects on P can be compared. Table 2, line 1 shows that on newspaper reading, the effect of education is about six times larger than the effect of income, when other variables are taken into account.

In the second panel of Table 2, the regression coefficients express the net effect on the dependent variable of a unit change in the predetermined variable. Thus, looking at the corresponding line in the second panel for each additional year of education, the frequency of newspaper reading averaged 0,25 points higher, net of income and age.

TABLE 1

ZERO ORDER CORRELATION COEFFICIENTS, MEANS AND STANDARD DEVIATIONS OF SELECTED VARIABLES IN A MODEL OF THE PROCESS OF ADOPTION OF CONVENTIONAL CONTRACEPTIVES FOR FAMILY PLANNING PURPOSES : MALE INDUSTRIAL WORKERS IN TWO FACTORIES.

Variables	E	I	A	P	S	F
Education (E)	**1.000**					
Income (I)	**.239**	**1.000**				
Age (A)	**—.321**	**.235**	**1.000**			
Newspaper reading (P)	**.651**	**.257**	—.166	1.000		
Ideal family size (S)	—.167	**—.132**	**.074**	—.147	1.000	
Adoption of Family Planning (F)	.143	**.424**	.223	.223	—.140	1.000
Mean	6.706	303.229	35.795	2.722	3.588	1.343
Standard Deviation	**4.027**	**131.423**	8.651	1.602	0.960	0.524

Further, for a typical respondent — by "typical" we mean that the educational attainment, income and age are at the mean of the sample,— the predicted frequency of newspaper reading is: 0.579 + (6.706) (0.251) + (303.229) (0.001) + (35.795) (0.002) or 2.722 which by definition is the mean frequency of newspaper reading (Table 1). For a respondent who had a higher level of educational attainment than the average, say 12 years, the predicted frequsncy of newspaper reading is: 0.579 + (12.0) (0.251) + (303.229) (0.001) + (35.795) (0.002) or 3.967, which is 1.245 higher than that of the "typical" respondent. Similarly for a respondent with "typical" education and age but with higher income, say Rs. 500.00 per month, the predicted score is 2.834. This is almost same as reading newspapers three or four times per week.

THE PROCESS OF ADOPTION OF FAMILY PLANNING PRACTICES

Having set the stage, let us examine the process of adoption of family planning practices under three headings.

1. *Influence of background factors on adoption of family planning practices.*

Bivariate associations (or gross associations) between any two variables are indexed by zero-order correlation coefficients. The three background variables, namely, education (E), income (I) and age (A) are positively associated with adoption of family planning (F). The correlation coefficients are: 0.143, 0.424, and 0.223 respectively (Table 1). Except for the gross association of I and F (r_{FI}) the other two associations are modest. The total effects of each of the three background factors on F are given by reduced form coefficients given in Table 2, line 4. The reduced form coefficients are the coefficients in an equation when each of the endogenous variables is related to the exogenous variables in the model. When a gross association is compared with its corresponding total effect, the latter is smaller than the former. For example, gross association between E and P is 0.143, and the total effect of E on F, net of I and A is 0.115 — a reduction of 0.028 or about 20 per cent (.028/.143 x 100 = 19.6). Similarly, gross association of I and A with F is also reduced by about

TABLE 2

EFFECTS OF SELECTED VARIABLES ON VARIOUS DEPENDENT VARIABLES FOR A MODEL OF THE PROCESS OF ADOPTION OF CONVENTIONAL CONTRACEPTIVES FOR FAMILY PLANNING PURPOSES: MALE INDUSTRIAL WORKERS IN TWO FACTORIES.

	Dependent Variable	Predetermined Variables					
		E	I	A	P	S	R^2
Standardized regression coefficients:							
(1)	P	0.630	0.104	(0.012)	—	—	0.435
(2)	S	—0.118	—0.119	(0.065)	—	—	0.041
(3)	S	(—0.085)	—0.114	(0.065)	(—0.052)	—	0.042
(4)	F	0.115	0.356	0.176	—	—	0.207
(5)	F	(0.019)	0.340	0.175	0.152	—	0.220
(6)	F	(0.011)	0.330	0.180	0.148	—0.085	0.227
Regression Coefficients:							constant
(7)	P	0.251	0.001	(0.002)	—	—	0.579
(8)	S	—0.028	—0.001	(0.007)	—	—	3.785
(9)	S	(—0.020)	—0.001	(0.007)	(—0.031)	—	3.801
(10)	F	0.015	0.001	0.011	—	—	0.430
(11)	F	(0.002)	0.001	0.011	0.050	—	0.401
(12)	F	(0.002)	0.001	0.011	0.048	—0.047	0.580

NOTE: Figures within parentheses are not significant at 0.05 level. Variables are: E—Education; I—Income; A—Age; P—Newspaper reading; S—Ideal family size; F—adoption of family planning practices.

17 per cent and 21 per cent respectively. In other words, the total association of each of the three background variables with F is reduced by about a fifth when the other two variables are taken into account. This shows that although the three background factors are correlated among themselves, their total effect on adoption of family planning are mostly (at least four-fifths) independent of each other.

Among the three factors, income has the largest effect on adoption of family planning, and it is three times larger than that of education and twice as large as age. If it can be assumed that income is an indicator of level of living, and if it is the policy of the government to encourage more and more people to adopt family planning practices, then we can tentatively conclude from the reduced form coefficients that an important precondition for higher rate of adoption is that the level of living of the people should rise.

2. Influence of background factors on mediating factors.

The model identifies two mediating variables, namely, frequency of newspaper reading (P) and ideal family size (S). Before examining the role of mediating factors on adoption of family planning, it may be instructive to examine the influence of background factors on mediating factors.

(a) *Newspaper reading:* The gross association of the three background factors with newspaper reading (P) is given in Table 1. Education (E) and income (I) are

positively associated with P whereas age (A) is negatively associated. When we regress P on the three background factors, the effects of all the three factors, including that of A are positive (Table 2, line 1). When we take into account the other two variables (E and I), the bivariate negative relationship between A and P revealed in Table 1 becomes positive. For these respondents we find that when education and income are taken into account, the relationship between age and newspaper reading is positive.

The gross association of E with P is 0.651 (Table 1). When I and A are taken into account, the effect of E on P becomes 0.630 — a negligible reduction (Table 2, line 2). On the other hand, the reduction for I is 60 per cent and for A it is 107 per cent. This shows that the zero-order relationships of A and I with P are due to their association with E. The gross association between two variables can be decomposed into its components according to the basic theorem of path analysis, which is:

$$r_{ij} = \sum_k p_{jk}\, r_{ki}$$

where i and j are any two variables in the system and k runs over all variables in the system from which direct paths lead to variable j. (For proof of this theorem, see: Duncan, 1966).

r_{PE}	=	p_{PE}	+	$p_{PI}\, r_{EI}$	+	$p_{PA}\, r_{EA}$
.651	=	.630	+	(.104) (.239)	+	(.012) (−.321)
.651	=	.630	+	.025	−	.004
100.0	=	96.8	+	3.8	−	0.6
Gross Association		Direct effect		Due to association with I		Due to association with A

This shows that almost all (about 97 per cent) of the effect of E on P is direct and very little is due to association of E with I or A. On the other hand,

r_{PI}	=	p_{PI}	+	$p_{PE}r_{IE}$	+	$p_{PA}r_{IA}$
.257	=	.104	+	(.630) (.239)	+	(.012) (.235)
.257	=	.104	+	.151	+	.003
100.0	=	40.5	+	58.8	+	1.2

This shows about 2/5th of the effect of I on P is direct and about 3/5th is due to association of I with E. Similarly, only 7 per cent of the effect of A on P is direct. All these show that education has large effect on newspaper reading and that effect is not due to association of education with income or age. Further, most of the effect of income and age on newspaper reading is due to their association with education only.

(b) *Ideal family size*: The gross associations of education (E) and income (I) with ideal family size (S) are negative (Table 1). The reduced form coefficients show that the total effects are also negative (Table 2, line 2). This shows that

higher the location of individuals in the stratification hierarchy, smaller is their ideal family size. In this study we find, that among those who have the same level of education and age, those who have higher income opt for smaller families. It is reasonable to argue that higher the income, higher the ability to support a large family. So one may expect higher the income, larger will be their ideal family size. But we find that this is not so. To put it differently, the argument that increased financial resources of the family will result in a large number of children is not supported by our data. Further, if we interpret income as an indicator of standard of living, if more and more people are to develop the concept of small family, their standard of living should rise.

As pointed out earlier, it is possible that when the older factory workers were forming their families, the concept of small family was not popularized by the government and other voluntary agencies. So, perhaps many of them produced many children. (The zero-order correlation coefficient between age and total number of children is 0.492). This is reflected in our data by the positive total effect of age, net of education and income, on ideal family size (Table 1, line 4).

3. *The role of mediating factors in the process of adoption of family planning practices.*

In addition to the three background factors, namely E, I and A, when we take into account newspaper reading (P), the total effect of income and age is hardly reduced (compare Table 2, lines 4 and 5). The total effect of I on F, net of E and A is 0.356. When P is also added, the effect becomes 0.340 — a reduction of about 4 per cent only. This shows that the effects of income and age are not mediated by newspaper reading. But, when newspaper reading is taken into account, the total effect of E is reduced from 0.115 to 0.019 — a reduction of almost 92 per cent. This shows that almost all the effect of education on adoption of family planning is via newspaper reading, or in broader terms, participation in mass media. Many studies on family planning have identified education as a very important variable for adoption of family planning practices. For this sample of factory workers we have identified a mechanism, namely newspaper reading, through which the influence of education operates. From the point of view of social engineering, those studies hypothesize education as a precondition for adoption of family planning practices. Our study suggests that instead of waiting for the population to be educated, manipulation of mass media may result in desirable level of adoption of conventional methods of family planning.

When we include ideal family size (S) in the model as an intervening variable, it mediates still further the influence of education on S (compare Table 2, lines 5 and 6). But the effects of all other variables in the model are not modified. The effect of S, net of all the variables in the model, on adoption of family planning is negative. In other words, larger the ideal family size of the respondent, lower the adoption of family planning practices. Net of all variables in the model, one additional child in the ideal family size, on the average, results in about 0.05 less adoption of family planning practices (Table 2, panel B, line 6).

One advantage of path analytic technique is that the total effect of one variable on the other can be decomposed into its constituent parts. For example:

Total effect	=	p_{FI}	+	$p_{PI}p_{FP}$	+	$p_{SI}p_{FS}$
.356	=	.330	+	(.104) (.148)	+	(−.114) (−.086)
.356	=	.330	+	.015	+	.010
100.0	=	92.6	+	4.2	+	2.8
Total effect of I on F		Direct effect of I on F		Effect via P		Effect via S

This shows that over 90 per cent of the total effect of income on family planning is direct and very little is via other mediating variables in the model. Earlier, we pointed out that very little of the gross association is reduced when we compare it with total effect. All these show that income has an important direct effect on adoption of family planning. On the other hand only 9.4 per cent of the total effect of education on adoption of family planning is direct and another 82 per cent is via newspaper reading.

POLICY IMPLICATIONS

A model like that of ours, which is written in structural equations, facilitates us to predict the outcome if certain variables are manipulated or changed. If such a variable is capable of being manipulated, then the direction in which policy measures may be undertaken can be specified.

The predicted score for "typical" respondent with regard to adoption of family planning is 1.34 (see Appendix A for the relevant calculations for this and following equations). It may be recalled that the score for adoption of family planning ranges from 0 to 2. So, the predicted score for the "typical" respondent implies that the "typical" predicted score is little more than having knowledge about conventional contraceptives.

Let us assume that by policy interventions the educational level of the workers is increased,. say to 12 years rather than 6 years as it is now, then the predicted score for newspaper reading will be 3.97 (or almost reading newspapers daily). Given the typical score for income and age, the policy manipulated score for education (12 years) and the predicted score for newspaper reading (3.97), the predicted score for ideal family size will be 3.45 children. Given the typical score for income and age, the manipulated score for education (12 years), the predicted scores for newspaper reading (3.97) and ideal family size (3.45 children), the predicted score for adoption of family planning is 1.41 or an increase by 0.07.

Let us assume that the respondents remain "typical" in two background variables (viz. education and age), but the income level is about twice as that of the present level (i.e., Rs. 600.00). Then the predicted score for newspaper reading will be 3.95. The predicted number of children in the ideal family size will be 3.30. For adoption of family planning, the predicted score will be 1.79. This is just 0.21 less than 2.00, the latter indicating adoption by all respondents.

Similarly, through social engineering if respondents are "made" to read newspapers every day (score of 4) all other conditions being the same, the predicted ideal family size will be 3.62 and the predicted score for adoption of family planning will be 1.39.

Among the three possibilities for manipulation of variables, increasing the level of income seems to be more promising, if

higher rate of adoption of family planning is the desired ideal. We would like to point out that we use level of income as an indicator of standard of living. Mere increase in wages and salaries does not lead to an increase in the standard of living, if the increase in wages is eaten up by rising inflation. So, *if it is socially desirable to increase the rate of adoption of family planning practices and thereby to reduce population growth, then increase in standard of living alone can achieve it.* We also assert that the standard of living should increase for all people and not only for a few. Only then there will be increased adoption of conventional methods of family planning.

MODIFIED MODEL

Table 2 contains many coefficients which are not statistically different from zero. In other words, the null hypothesis that the slope equals zero (b*=0) is not rejected at .05 probability level.

If we fail to reject a hypothesis when it should have been rejected, we will commit Type II error. In order to examine this possibility, we erased the paths that are not statistically significant and recomputed the coefficients. This procedure implies that the omitted variables make a negligible contribution to explanation of variation in the dependent variable. The results are presented in Table 3 (and also as Figure la). When we compare the relevant coefficients of determination in Table 2 and 3, we find that they are similar for newspaper reading (P) and adoption of family planning (F). For ideal family size (S) and R^2 of the modified model is smaller than the R^2 of the hypothesized model (compare Table 2, line 3 and Table 3, col. 2). Further, when the relevant regression coefficients (both standardized and unstandardized) are compared, we find that for both P and F, they are similar. So, our interpretation of the causal relationships, presented earlier, does not differ whether the hypothesized model or modified model is presented. In the case of S, the coefficients in the modified model are smaller than the ones in the hypothesized model. This suggests, that for ideal family size if we erase the paths that are now not significant at .05 level, we lose some information and E and P also have an influence on S.

TABLE 3

EFFECTS OF SELECTED VARIABLES ON VARIOUS DEPENDENT VARIABLES FOR A REVISED MODEL OF THE PROCESS OF ADOPTOIN OF CONVENTIONAL CONTRACEPTIVES FOR FAMILY PLANNING PURPOSES: MALE INDUSTRIAL WORKERS IN TWO FACTORIES.

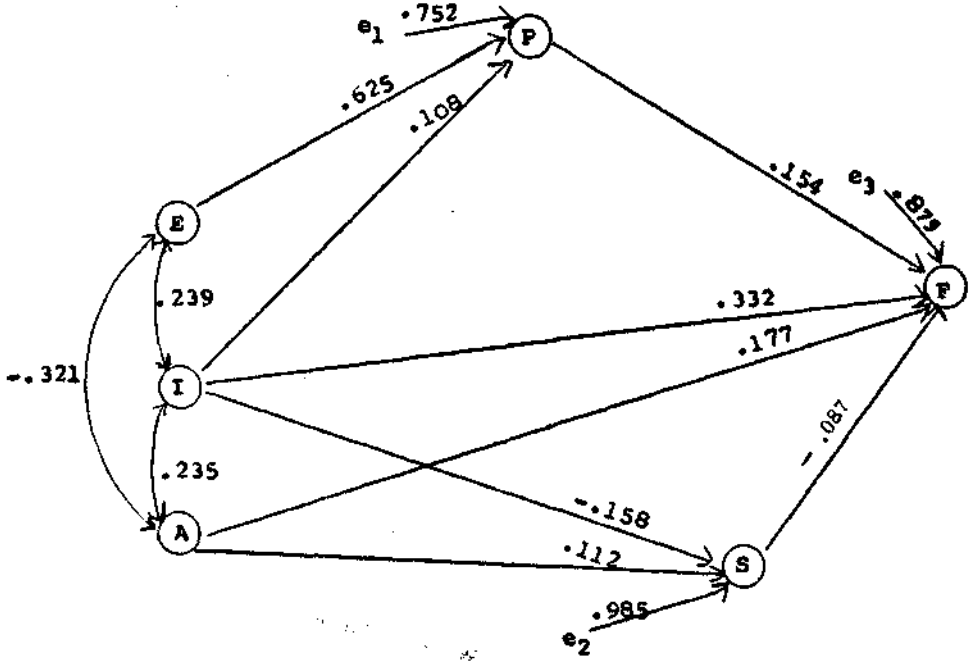
Predetermined Variables	Dependent Variable		
	P	S	F
Standardized regression coefficients:			
E	0.625	—	—
I	0.108	—0.158	0.332
A	—	0.112	0.177
P	—	—	0.154
S	—	—	—0.087
Coefficient of alienation	0.752	0.985	0.879
Regression coefficients:			
E	0.249	—	—
I	0.001	—0.001	0.001
A	—	0.012	0.011
P	—	—	0.051
S	—	—	—0.047
Constant	0.656	3.495	0.590
Coefficient of determination	0.434	0.029	0.227

NOTE : Variables are: E — education; I — income; A — age; P — newspaper reading; S — ideal family size; F — adoption of family planning practices.

EVALUATION OF THE MODEL

On the assumption that adoption of family planning is an ongoing and multifaceted process, we constructed a multivariable model to explain and interpret the inter-relationships among various vari-

FIGURE la : A modified model of the process of adoption of conventional contraceptives for family planning purposes: Male industrial workers in two factories.



NOTE: Variables are: E-education; I-income; A-age; P-newspaper reading; S-ideal family size; F-adoption of family planning.

ables. In constructing the model, we made certain simplifying assumptions and limited our attention only to a few selected variables (Blalock, 1961: 7-17). Two simplifying assumptions we made use of are: first, that the variables are linear, and second, that the inter-relationships among variables are additive. We also limited our attention to a total of six variables only. These variables are selected on the basis of prior research and theoretical importance,

A critic may charge that the choice of variables included in the model is not adequate and variables other than the ones now included should have been included. Without dogmatically asserting that our choice of the variables is the best, we would like to point out that these variables are identified as some of the more important variables in prior research in this area.

A discerning reader would have noted large paths from residually defined variables. This shows that more variables than that are now included in the model are involved in the process of adoption of family planning. Perhaps variables like type of family, number of children, upward mobility orientation are some of those variables. Further, adoption of family planning is a joint decision between husband and wife. So, an enquiry into the manner in which women adopt family planning is very essential. Above all, more accurate measurement of variables, better scaling techniques and in-depth multivariate

approaches are essential to comprehend the process of adoption of family planning so that effective policy measures may be evolved.

SUMMARY

In order to understand the complicated process of adoption of family planning, a multivariate model based on prior research is constructed. We made two simplifying assumptions, namely, that the variables are linear and the relationship among the variables are additive. Further, we limited our attention to only six variables.

We hypothesized that three background factors (education, income and age) influence frequency of newspaper reading. The background factors and newspaper reading influence the concept of ideal family size and all these variables determine adoption of family planning in a causal sequence.

Making use of the technique of path analysis, we tested the model on a sample of male respondents drawn from two factories. We found that education has a large effect on newspaper reading. The effects of income and age on newspaper reading, although positive, are mostly due to association of these variables with education. Although there is a substantial total effect of education on adoption of family planning practices, when newspaper reading is taken into account, the total effect of education is very much reduced. Newspaper reading or participation in mass media is the mechanism through which the effect of education operates. Further, income has the largest effect on adoption of family planning. The effect of income is not reduced by the mediating variables included in the model. In terms of policy implications we showed that in order that more people may adopt family planning devices, the level of income and standard of living should increase.

REFERENCES

Agarwala, S. N. 1962 — *Attitudes Towards Family Planning in India.* Bombay: Asia Publishing House.

Bhogle, Shalini and Surjit Kaur 1972 — *Adoption of Family Planning in Two Industrial Settings.* New Delhi: Council for Social Development.

Blalock, Hubert M., Jr. 1961 — *Causal Inferences in Nonexperimental Research.* Chapel Hill: University of North Carolina Press.

Census of India 1971 — *Provisional Population Totals.* Paper 1 of 1971-Supplement. Delhi: Manager of Publications, 1971.

Duncan, Otis Dudley 1966 — "Path Analysis: Sociological examples". *American Journal of Sociology* 72 (July): 1-16.

Hauser, Robert M. 1972 — *Socio-Economic Background and Educational Performance.* Rose Monograph Series. Washington DC: American Sociological Association.

Heise, David R. 1969 — "Contingencies in Constructing Causal Models". pp. 38-73 in E. F. Borgatta and G. W. Bohrnstedt (eds.), *Sociological Methodology,* San Francisco: Jossey-Bass.

Krishnamurthy, K. G. 1968 — *Research in Family Planning.* Delhi: Sterling Publishers.

Land, Kenneth C. 1969 — "Principles in Path Analysis", pp. 3-33 in E. F. Borgatta and G. W. Bohrnstedt (eds.) *Sociological Methodology.* San Francisco: Jossey-Bass.

Rao, Kamala Gopal n.d. *Studies in Family Planning in India and Review for Programme Implications.* New Delhi: Central Family Planning Institute.

Repetto, Robert 1968 "India: A Case Study of the Vasectomy Programme" *Studies in Family Planning* 31 (May): 8-18.

Schramm, Wilbur 1971 "Communication in Family Planning". *Reports of Population/ Family Planning* No. 7. April.

Sewell, William H., and Vimal P. Shah 1967 "Socio-Economic Status, Intelligence, and the Attainment of Higher Education". *Sociology of Education* 40 (Winter): 1-23.

Shah, Vimal P, Tara Patel and William H. Sewell. 1971 "Social Class and Educational Aspiration in an Indian Metropol's". *Sociological Bulletin,* 20 (Sept): 113-133.

Wright, Sewell 1934 "The Method of Path Coefficients". *Annals of Mathematical Statistics* 5 (September): 161-215.

Appendix 'A'

1. Predicted adoption of family planning score for a respondent who is at the mean in all variables (i.e. "typical").

$$\hat{\bar{F}} = a + b\bar{E} + b\bar{I} + b\bar{A} + b\bar{P} + b\bar{S}$$

$$1.343 = .580 + (.002)(6.706) + (.001)(303.229) + (.011)(35.795) + (.048)(2.722) + (-.047)(3.588)$$

2. If $\bar{E} = 12.0$

$$\hat{\bar{P}} = a + b(12.0) + b\bar{I} + b\bar{A}$$

$$3.967 = .579 + (.251)(12.0) + (.001)(303.229) + (.002)(35.795)$$

$$\hat{\bar{S}} = a + b(12.0) + b\bar{I} + b\bar{A} + b\hat{\bar{P}}$$

$$3.450 = 3.801 + (-.020)(12.0) + (-.001)(303.229) + (.007)(35.795) + (-.031)(3.967)$$

$$\hat{\bar{F}} = a + b(12.0) + b\bar{I} + b\bar{A} + b\hat{\bar{P}} + b\hat{\bar{S}}$$

$$1.412 = .580 + (.002)(12.0) + (.001)(303.229) + (.011)(35.795) + (.048)(3.967) + (-.047)(3.450)$$

3. If $\bar{I} = 600.00$

$$\hat{\bar{P}} = a + b\bar{E} + b(600.00) + b\bar{A}$$

$$3.950 = .579 + (.251)(6.706) + (.001)(600.00) + (.002)(35.795)$$

$$\hat{\bar{S}} = a + b\bar{E} + b(600.00) + b\bar{A} + b\hat{\bar{P}}$$

$$3.302 = 3.801 + (-.020)(6.706) + (-.001)(600.00) + (.007)(35.795) + (-.031)(3.950)$$

$$\hat{\bar{F}} = a + b\bar{E} + b(600.00) + b\bar{A} + b\hat{\bar{P}} + b\hat{\bar{S}}$$

$$1.787 = .580 + (.002)(6.706) + (.001)(600.00) + (.011)(35.795) + (.048)(3.950) + (-.047)(3.302)$$

4. If $\bar{P} = 4.0$

$$\hat{\bar{S}} = a + b\bar{E} + b\bar{I} + b\bar{A} + b(4.0)$$

$$3.615 = 3.801 + (-.020)(6.706) + (-.001)(303.229) + (.007)(35.795) + (-.031)(4.0)$$

$$\hat{\bar{F}} = a + b\bar{E} + b\bar{I} + b\bar{A} + b(4.0) + b\hat{\bar{S}}$$

$$1.389 = .580 + (.002)(6.701) + (.001)(303.229) + (.011)(35.795) + (.048)(4.0) + (-.047)(3.615)$$

Note: The coefficients are from Table 2 and the means from Table 1. The subscripts for regression coefficients are not indicated.