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Socioeconomic Correlates of Fertility in Nepal[1]

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INTRODUCTION

In recent years, Nepal has experienced a gradual decline in fertility. Over a ten years period the total fertility rate (TFR) has fallen from 6.2 during 1971-1976 to 5.6 during 1980-1985 (Tuladhar 1989). Socioeconomic changes and the promotion of family planning program should have played some role in the recent decline in fertility. It has been argued that the rise in age at marriage and contraceptive prevalence rate, mostly of male and female sterilization, are among the factors underlying the recent decline in fertility in the country (Tuladhar 1989). Micro level study carried out in the country has demonstrated the impact of development projects on fertility limitation (Axinn 1992).

Few cross-sectional studies conducted in mid-seventies and early eighties on fertility decline in LDCs have also established the importance of socioeconomic development and family planning program as major determinants (Srikantan, 1977; Mauldin and Berelson 1978; Tsui and Bogue 1978; Cutright and Kelly 1981).

Fertility in Nepal, is marked with wide range of spatial variations. Our own estimate demonstrates that TFR in 1981 ranged from a low of 4.92 in the mountain region of Western Development Region to a high of 7.07 in terai region of Far Western Development Region. Variations are also expected to be quite large across districts. There is also wide disparities in the levels of socioeconomic development among the subregions (Shrestha 1993). The variations both in fertility and socioeconomic development and family planning behaviour has generated much attention to understand the interrelationship between them. Few studies following the micro-demographic approach examined the influence of varied socioeconomic setting on family formation by controlling ethnicity/culture (Fricke 1994). Yet, in the context of Nepal no attempt has been made to

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examine the areal variations in fertility in the context of sub-regional variability in the socioeconomic development and family planning behaviour. It is in this light the present study makes a modest attempt to widen this discussion.

The primary objective of the present study is to establish the relationship between socioeconomic development, family planning and fertility for the year 1981 considering sub-regions as areal unit of analysis. More specifically, the study will attempt to ascertain the effect, direct and indirect, of selected socioeconomic development and family planning variables on fertility.

ANALYTICAL FRAMEWORK AND HYPOTHESIS

The theoretical model that we will use in the present study is presented in Fig. 1. In our model we have hypothesized that both socioeconomic development and contraception have negative direct effects on fertility. We further postulate that socio - economic development affects fertility indirectly through contraception. However, the direct effects of fertility on contraception is assumed to be positive. These are represented by the appropriate signs in the diagram.

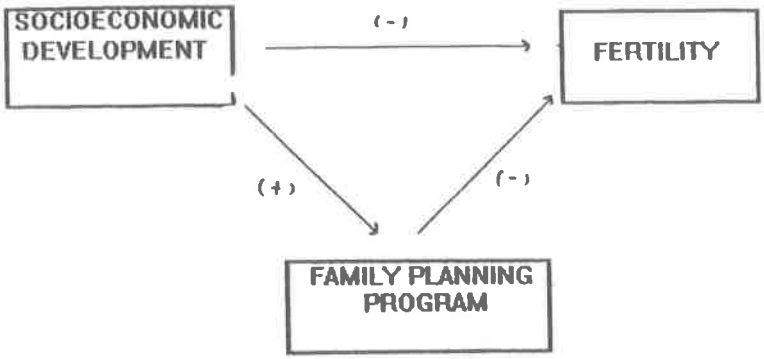
Previous researches have identified host of socioeconomic development factors that affects contraception and fertility. However, the indicators of development center around education, labour force participation, infant and child mortality, per capita income, age at marriage, urbanization etc. Here we briefly discuss the mechanism of the effects of some of the development indicators that we will be using in our subsequent analysis.

Socioeconomic development is accompanied by several concomitant changes in the society. Changes in education level is one among them. The increase in educational level has several consequences inimical to high fertility. Consequent to the high level of education, there will be more positive attitudes towards birth control and also better access to various means of birth control, higher labour force participation and also rise in age at marriage, increase in the opportunity cost of child bearing for women, higher parental aspirations for themselves and for their children, and higher status of women (Heer 1970; McGreevey and Birdsall 1974; Cassen 1976; Morawetz 1978; Kasarda et al. 1986; Goldsheider and Waite 1986).

In traditional society which is characterized by early age at marriage and almost universal marriage, education beyond the primary years can serve to postpone marriage, delaying the usual onset of fertility (Hess 1988). It has also been argued that the negative impact of parental

education on fertility will emerge only when a threshold level of education is attained (Singh and Casterline 1985). Cochrane (1979) also noted that initial increase in parents' education are associated with rising fertility. It is therefore, difficult to be definitive regarding the direction and magnitude of the effect of education on fertility if any such threshold level exist as the level will vary across time and space.

Figure 1
Diagram of the Theoritical Model



Socioeconomic development increases the work participation rate of women. There are several ways in which work and fertility may be related. Firstly, there will be a conflict between work and child bearing of women which will reduce the desired family size. However, the conflict between work and child bearing depends upon the alternative means of child care. Secondly, work may enhance the status of women in their families which may increase their ability to limit fertility successfully. Finally, work may increase women's exposure to various birth control measure. However, what is more important is the nature and place of work (Cassen 1976).

It can also be supposed that a usual consequence of increase in socioeconomic development is a decline in mortality level especially infant and child mortality through better health facilities, both preventive and curative. Some of the fertility reducing effects of infant and child mortality rate are of a biological nature. The decline in infant and child mortality rate will bring down the fertility through various effects viz.; "physiological effect" (lactation effect), "replacement effect", and "insurance effect" (Preston 1975 and 1978; Cassen 1976; Birdsall 1977; Hess 1988). Better health facilities will also make the family planning services more accessible to the couples and therefore, will help to reduce fertility level through the adoption of those services.

Socioeconomic development is also characterized by high age at marriage. Higher age at marriage will shorten the women's reproductive span and will thus reduce the actual fertility. We, therefore, expect a negative direct effect of age at marriage on fertility.

Another important characteristics of socioeconomic development is urbanization. In the context of urbanization one may witness changes in the attitude of parents towards children. Children are no longer treated as an old age security. The dependence of parents on their children as a buffer against adversity will be largely reduced (Cho et al. 1977). In urban areas children tend to become increasingly a financial burden. The other intermediate variables through which fertility gets effected are: increased work opportunity of varied nature, educational opportunities and emergence of nuclear family. Urbanization is also followed by behavioural changes is social process and individual decision making. Behavioural mechanism for the decline in fertility are delayed marriage and increased acceptance of birth control methods. In our analysis we have treated density as a proxy of urbanization. We expect negative relationship between density, urbanization and fertility.

The importance of contraception in limiting fertility need not be over emphasized. Government's family planning/population policy, abortion policy, availability of birth control services and actual use of contraception have a significant impact on fertility. Previous studies have clearly brought out proximate or intermediate variables, determining fertility (Bongaarts 1982). One is obviously the contraception variable. We therefore, expect a direct and negative effect of contraception on fertility.

DATA AND METHODS

The present study analyses the fertility patterns of 15 sub-regions of the country and relates it to the socioeconomic development and family planning. In order to test our theoretical model discussed earlier we, at the minimum, need data on socioeconomic development, family planning and fertility.

Measures of Dependent variable

Total fertility rate (TFR) in 1981 is our fertility measure and hence our *dependent variable*. We estimated TFR by adopting P/F Ratio Method, for the detailed discussion on the P/F Ratio method readers may refer to *Indirect Techniques for Demographic Estimation Manual* X, UN 1983, New York, an indirect demographic technique originally developed by Brass (1975). While adopting this technique P2/F2 and P3/F3, where P2 and P3 refer to children ever born of women in the age group 20-24 and 25-29 respectively while F2 and F3 are estimated average cumulative fertility

rates have been considered separately as a correction factor for adjusting the age-specific fertility rate (AAFR) and thus TFR. TFR corresponding to P2/F2 and P3/F3 were obtained separately. The average of these two has been considered as a representative TFR for the year 1981. The use of the method warranted following information:

(i) The number of children ever born classified by five years age group of mother from 15-19 to 45-49;
(ii) The number of children born during the year preceding the survey or census classified by five year age group of mother; and
(iii) The total number of women in each five year age group.

The above required information were obtained from the Fertility Tables of the Population Census of 1981.

Measures of Independent Variables

Socioeconomic development is a multi-dimensional phenomenon. It involves various dimensions such as agriculture, education, health, industry, urbanization, transport and communication, power and other household amenities.

In the present study we have, however, considered 11 variables limiting to mostly education, health, employment and urbanization factors of development. Total literacy rate (TLR) and female literacy rate (FLR) are the educational variables. Infant mortality rate (IMR), number of hospital beds per 100,000 population and number of doctors per 100,000 population represents our health variable.

Similarly, economically active male (EAM) and economically active female (EAF), both 15 years and above, reflect the employment status. Economically active female variable is often considered as a proxy for the status of women. Proportion urban (PURB) and density (DEN) per square km. are the urbanization variables. All these selected variables roughly represent the socioeconomic situations of the sub- regions. Male age at marriage (AMM) and female age at marriage (AMF) are the demographic variables we have included in our study. The variables are no way exhaustive. In fact the selection of variables was constrained by the availability of data.

In the context of LDCs any model that investigates fertility determinants will be mis-specified without including the indicators of family planning programme and thus will overestimate the importance of socioeconomic development (Cutright 1983). Considering this into account we have included family planning variable in our analysis. Our family planning variable was represented by the sterilized couples as well

We could not use any other family planning variables due to the paucity of data for the required level of aggregation. All these variables - socioeconomic development, demographic and family IMR planning - forms our *independent variables.* The values generated for all these variables are the weighted averages of all the districts falling in each of the sub-regions, weights being the population of the corresponding districts.

The descriptive statistics of all the variables and their specific sources are presented in Table 1. Data values for all 13 variables for each of 15 sub-regions are presented in Appendix A.

Descriptive statistics in Table 1 shows that TFR in 1981 has a mean value among 15 sub-regions of 6.09, varying from minimum of 4.92 in the western mountain to a maximum of 7.07 in far-western terai. Considerable variability among sub-regions on socioeconomic development variables is also apparent from Table 1. We expect that the variations in fertility are systematically associated with the variation in socioeconomic development.

Fertility level in a given time is not only affected by the present socioeconomic condition but also its previous levels. Many cross-national studies focusing the relationship between development, family planning and fertility solved the problem by associating lagged socioeconomic variables with the current level of fertility and family planning (Berelson 1974; Srikantan 1977; Mauldin and Berelson 1978; Cutright and Kelly 1981). In our present study we could not examine the relationship by introducing the lagged model due to the unavailability of the required data.

Methods

In the present study we have used Path Analysis, for a comprehensive discussion on Path Analysis readers may refer to Otis Dudley Duncan's "Path Analysis: Sociological Examples" *The American Journal of Sociology,* Vol. 72, No. 1, pp. 1-16, 1966, a multivariate technique, to test our theoretical model presented in Figure 1. This technique is very much useful in explicating causal model.

Table 1
Descriptives Statistics of Variables: 15 Sub-regions of Nepal, 1981

	Variable	Mean	Std Dev	Minimum	Maximum
1.	IMR	166.93	37.90	199.9	239.5
2.	TLR	20.93	5.37	12.3	28.8
3.	FLR	10.30	3.76	4.7	17.1
4.	AMM	20.98	1.98	18.6	25.7
5.	AMF	17.48	2.27	14.8	23.4
6.	EAM	84.81	3.53	79.6	92.1
7.	EAF	52.91	16.41	27.2	84.04
8.	DEN	109.09	84.87	3.4	290.7
9.	HOS	16.78	19.25	.0	75.2
10.	DOC	3.09	3.14	.4	10.2
11.	PURB	6.67	10.99	.0	41.6
12.	CPR	2.44	1.93	.13	6.41
13.	TFR	6.06	.60	4.92	7.07

Sources : 1. *Data Archives*, Central Department of Population Studies, Tribhuvan University, Kathmandu, Nepal.
2,3,6,7,8,11 , *Population Census of Nepal, 1981* (Relevant Tables), Central Bureau of Statistics, Kathmandu, Nepal, 1984.
4,5 , *Population Monograph of Nepal,* Central Bureau of Statistics, Kathmandu, Nepal, 1987.
9,10 , *Health Information Bulletin*, Vol. 2, No. 2, Ministry of Health, HMG/Nepal.
12 and 13, From the Official Records of the Family Planning and Maternity and Child Health Project (FPMCH), Ministry of Health, HMG/Nepal.

RESULTS

Earlier we proposed a theoretical framework wherein were hypothesized the direct negative effects of socioeconomic development and family planning variables on fertility. We also postulated that socioeconomic development variables affect fertility indirectly through contraception. Based on our theoretical framework we have developed a detailed model in Figure 2 for estimation. The Figure also explains the causal order of the variables influencing fertility. As mentioned before the diagram uses conventional path analysis. Our causal assumptions constituting the path model is based on findings of the previous studies on the relationship between socioeconomic development, family planning and fertility. Path analysis is useful for the sort of analysis we proposed to do. It is appropriate as it states not only the causal ordering of the variable but also the direct and indirect paths by which socioeconomic development variables effect fertility.

FIGURE 2
Path Diagram of Factors Affecting Total Fertility Rate

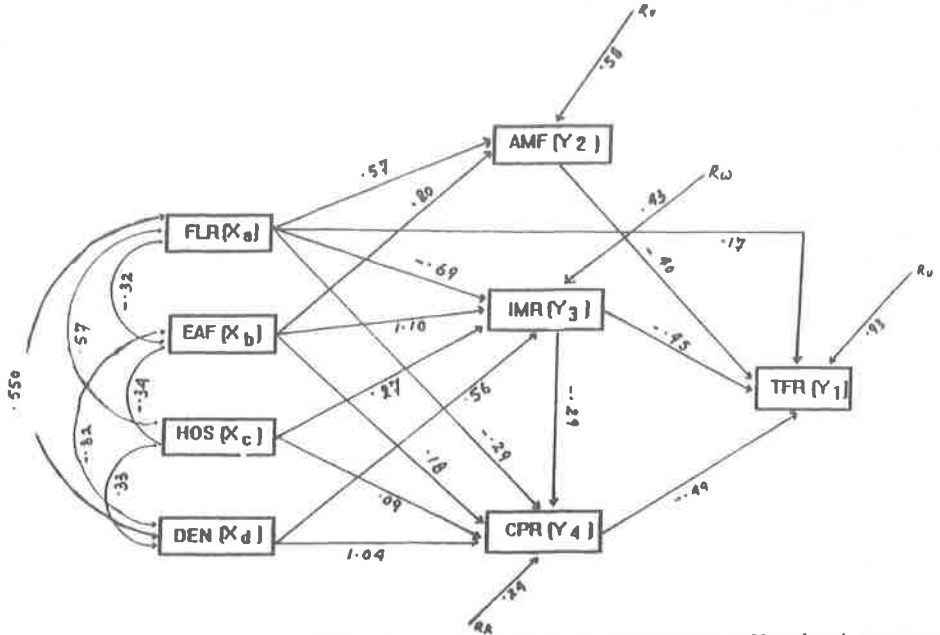


Figure 2 posits that TFR of a sub-region in Nepal is affected, among other things, by females age at marriage, infant mortality rate and contraceptive prevalence rate. One exogenous variable - female literacy rate - is also believed to have the direct effect on total fertility rate. It may be noted that the influence of economically active female (EAF), hospital beds per 100,000 population (HOS) and density (DEN) is assumed to be indirect through infant mortality rate (IMR) and contraceptive prevalence rate (CPR). The figure also posits the indirect effect of economically active population which is expected to be mediated through female age at marriage, infant mortality rate and contraception.

We have excluded other variables from our model to avoid the problem of multicollenearity. Because in such situation it is difficult to estimate reliably the individual effects of highly interrelated variables (See Appendix B). The path diagram of Figure 2 leads us to the following four structural equations for estimation.

$$Y_1 = P_{12}Y_2 + P_{13}Y_3 + P_{14}Y_4 + P_{1a}X_a + P_{1u}R_u \quad (1)$$

$$Y_2 = P_{2a}X_a + P_{2b}X_b + P_{2v}R_v \quad (2)$$

$$Y_3 = P_{3a}X_a + P_{3b}X_b + P_{3c}X_c + P_{3d}X_d + P_{3w}X_w \quad (3)$$

$$Y_4 = P_{4a}X_a + P_{4b}X_b + P_{4c}X_c + P_{4d}X_d + P_{43}Y_3 + P_{3k}R_k \quad (4)$$

All the variables in the equations are in standardized form. Y_i variables are endogenous because the model propose that they are dependent on at least one other variables in the model. X_i are the exogenous variables ad R_i are the residual effects of unmeasured variables which are assumed to be uncorrelated with the other determining variable in each equations.

The P_{ij} in the equations are the *path coefficients* which represents the direct effect on variable i from J. The first coefficient indicates the variable that is affected (the one in the box to which the arrow is pointing). The second coefficient indicates the variable that produces the effect. The curved double-headed arrows represents the unanalysed correlation between exogenous variables. It should be noted here that our model is *recursive* (i.e., we postulate that there is no feedback effects). "Given the situation that residual effects are uncorrelated with each other and with the exogenous variables in the model, the equations can be solved by ordinary least square regression. In this case the path coefficients will be equal to the partial regression coefficient in standard form or Beta coefficient of the regression results". (Hermalin undated, pp 282).

The results of our analysis are reported in Table 2. Total, direct and indirect effects of all the independent variables on total fertility may be seen in the Table 2. The total effect of an independent variable on total fertility is the zero order correlation. The total effect has been decomposed into direct, indirect and "not direct". The direct causal effect is the effect that is not mediated by any other variable included in the model and therefore, it represents the path coefficient between the independent variable and total fertility rate.Indirect casual effects is an effect that one variable has on another that is mediated by one or more intervening variables. The magnitude of this indirect effect is obtained by taking the product of the corresponding path coefficients.

The results presented in Table 2 show a sizable direct negative effect of contraception (CPR) on fertility (p= -0.495). The effect of contraception is high compared to the effect of other variables. Similarly, the direct negative effect of female age at marriage (AMF) on total fertility rate (TFR) is in the expected direction with its path coefficients (p = -0.403). Although female literary rate (FLR) shows a sizable direct position effect on female age at marriage (p = -0.565), its direct as well as indirect positive effect on female age at marriage female (AMF), infant mortality rate (IMR) and contraception (CPR) on total fertility rate is trivial but still positive. This rather unexpected relationship needs further probing.

As hypothesized, economically active female (EAF) has a strong indirect negative effect on total fertility rate. Its indirect effect was

mediated mainly through infant mortality rate (p= 0.4972) and through female age at marriage (p = -0.403). Its indirect negative effect through contraception is, however, trivial. The direct effect of infant mortality rate which is negative is not in the expected direction (p = -0.452). This refutes our hypothesis of the positive association between infant mortality rate and total fertility rate. It should, however, be noted that its indirect effect through contraception is positive but trivial.

Table 2
Component Effects of Different Variable on Total Fertility Rate

Variables	Total	Effects		
		Direct	Indirect	Not Direct
FLR	.093	.172	.229	-.308
AMF	-.133	-.403	NA	.270
EAF	-.230	NA	-.909	.679
HOS	.342	NA	-.163	.505
DEN	.120	NA	-.769	.889
IMR	-.260	-.452	.144	.048
CPR	.106	-.495	NA	.601

Note: In models with correlated exogenous variables it is not always possible to distinguish between indirect effects and spurious components. We have consider this as "not direct" effects. (John H. Mueller et al., in *Statistical Reasoning in Sociology,* Houghton Miffen Company, Boston, 1977, p. 327).

Source: As of the Table 1.

Our results also indicate the negative indirect effects of both density and hospital beds variables. the effects of density mediating through contraception is almost double (p = -0.5148) compared to its mediating effect through infant mortality rate which is -0.245. Although the effects of hospital beds operating through infant mortality rate and contraception is negative its effect is trivial. Among all the variables the most important variables are contraception and female age at marriage.

DISCUSSIONS

In the present study our main focus was to examine degree to which socioeconomic and family planning variables are related to fertility in Nepal. 15 sub- regions of the country were treated as the areas units for analysis. The relevance of this issue has its foundation of the existing variations, quite considerable, in fertility, socioeconomic development and family planning. We estimated total fertility rate by adopting indirect demographic technique. Data for various socioeconomic, demographic and family planning variables were gathered from various published and unpublished sources.

The Path Analysis which was used to test our theoretical model revealed a sizable negative direct effect of contraception and female age at marriage on fertility. Regarding the indirect effect of development on fertility our results demonstrated a strong negative indirect effect of economically active female population and density on total fertility rate. While the effects of economically active female population mediated its effect through infant mortality rate and female age at marriage, the effects of density was mainly through contraception. Hospital bed, however, had a trivial indirect effect through the joint path of infant mortality rate and contraception.

It should be noted here that the direct effect of female literacy on fertility was positive which is rather unexpected. This warrants further discussion. The results might reflect following: (a) As Cochrane (1979) pointed out, the initial rise in female literacy tend to have the positive effect on fertility which might be true in the case of Nepal. (b) Often noted, there could be some threshold level of education required in order to have the negative effects of female education on fertility. Nepal might not have attained that threshold level of education. (c) Our findings can also be considered as a reflection of the existing low status of women in terms of their decision making power. Female autonomy influences the decision making power of women mainly to the use of contraception (Morgan and Niraula 1994). In our society wife has a very little say on the matter of contraception, whether to use or not. Virtually, male dominates in such decisions. In view of this, male literacy could turn out an important predictor than female literacy. Further analysis is desired to investigate the issue. The negative direct effect of infant mortality rate on fertility contradicts the conventional wisdom of its positive direct effect on fertility. This also needs further probing.

CONCLUSION

Findings of the present study should be taken as tentative. Our path model is able to explain only 14 percent of the variation in the total fertility rate. None of the path coefficients are significant. This could be due to several factors. Obviously, present study suffers from the problem that arise from fewer number of observations. Much larger number of observations with smaller areas units e.g. district, in our case, would have been more desirable. This obviously requires more financial commitment for processing and analyzing the larger data set. But due to the resource constraint we could not venture to do so. None the less, we strongly recommend for a separate study which will consider district as an areal unit. We expect that this could shed more light on the issue under investigation.

Appendix A. Values for the Fertility, Socioeconomic and Family Planning Variables : 15 Sub-regions of Nepal, 1981

Sub-Regions	IMR	TLR	FLR	AMM	AMF	EAM	EAF	DEN	HOS	DOC	PURB	CPR	TFR
Eastern Mt.	162.8	26.5	12.1	23.7	20.1	82.0	66.3	32.4	13.3	2.7	.0	.21	6.43
Eastern Hill	154.8	25.3	11.7	22.9	19.6	82.3	59.3	116.9	7.2	1.2	2.5	2.32	6.81
Eastern Terall	119.9	28.8	16.8	20.6	16.6	80.4	30.4	290.7	22.5	3.0	18.4	6.23	6.29
Central Mt.	170.9	15.6	6.9	22.0	18.6	86.0	56.9	65.8	9.7	1.7	.0	1.09	6.27
Central Hill	170.9	28.6	17.1	21.6	18.1	79.6	47.8	178.6	75.2	10.2	41.6	3.39	6.24
Central Teral	126.7	18.8	9.3	18.9	14.8	85.6	27.2	256.0	10.0	1.4	11.1	6.41	5.56
Western Mt.	172.2	22.4	12.4	25.7	23.4	85.1	75.1	3.4	7.5	10.0	.0	.13	4.92
Western Hill	145.4	27.5	14.1	21.8	18.0	79.9	57.5	117.4	16.1	2.4	6.2	3.01	6.00
Western Teral	136.3	22.1	11.0	18.6	15.3	84.3	36.0	182.1	13.2	1.8	5.6	3.63	5.66
Midwest Mt.	239.5	12.3	4.7	20.5	17.1	92.1	84.0	11.4	6.7	1.7	.0	1.09	5.89
Midwest Hill	218.2	16.1	6.6	19.7	17.0	87.3	58.4	76.0	1.4	.6	1.5	1.29	6.67
Midwest Teral	137.9	18.3	9.3	20.2	16.5	86.1	40.4	91.7	14.5	1.9	5.7	2.87	6.29
FarwestMt.	214.8	15.5	6.2	19.4	16.2	85.1	58.3	36.4	.0	.4	.0	1.02	5.14
Farwest Hill	209.4	17.0	7.6	19.9	15.5	89.5	60.5	89.4	9.9	1.3	.0	1.20	5.70
Farwest Teral	124.2	19.1	8.7	19.2	15.4	86.8	35.5	88.1	44.5	6.1	7.4	2.78	7.07

Appendix B: Correlation Matrix of Selected Socioeconomic Variables and Total Fertility Rate

	AMF	AMM	CPR	DEN	DOC	EAF	EAM	FLR	HOS	IMR	PURB	TFR	TLR
AMF	1												
AMM	0.98	1											
CPR	-0.54	-0.47	1										
DEN	-0.47	-0.41	0.96	1									
DOC	0.5	0.49	-0.05	-0.03	1								
EAF	0.62	0.58	-0.84	-0.83	0.05	1							
EAM	-0.28	-0.33	0.37	0.47	-0.32	0.34	1						
FLR	0.31	0.38	0.45	0.55	0.55	-0.32	-0.88	1					
HOS	-0.07	-0.02	0.3	0.33	0.7	-0.35	-0.43	0.57	1				
IMR	0.11	0.03	-0.68	-0.64	-0.19	0.77	0.57	-0.59	-0.33	1			
PURB	-0.13	-0.09	0.56	0.62	0.56	-0.46	-0.56	0.69	0.87	-0.32	1		
TFR	-0.13	-0.1	0.11	0.12	0.09	-0.23	-0.14	0.09	0.34	-0.26	0.16	1	
TLR	0.34	0.42	0.36	0.48	0.43	-0.27	-0.92	0.97	0.48	-0.59	0.56	0.19	1

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