Socioeconomic Development and Fertility in India

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Abstracts. *This study investigates the relationship between the level of socioeconomic development and fertility in India. The perspective of this study is based on the "Theory of Demographic Transition" which states that as socioeconomic development in a country increases, high fertility and mortality rates are replaced by low fertility and mortality rates, leading to population stability. This study tests the following major hypothesis: The higher the level of socioeconomic development, the lower the fertility rates among the states of India. The study applies correlation and multiple regression analysis on the 1992-1993 Indian National Family Health Survey (NFHS) data using four major categories (education, modernization, health, and family planning) of socioeconomic development to predict two measures (crude birth rate and the total fertility rate) of fertility. The findings support the theory of demographic transition in large measure revealing that the overall level of socioeconomic development is inversely related to fertility among the states of India. Finally, the study suggests that higher levels of female literacy and acceptance of contraceptives lead to fertility decline.*

Keywords: Demographic transition; socio-economic conditions; fertility; decline; India.

1. Introduction

Two words describe India's population in the 2000s: large and growing. India's population increased from 238 million in 1901 to 361 million in 1951. The pace of growth accelerated in the 1950s (India gained its independence in 1947), and the population reached 1,027 million by the time of the 2001 Census. During the last single decade (1991-2001), the population increased by 166 million, or 21 percent (India, Registrar General and Census Commissioner, 2001). With its 1 billion population, India's

population density is the second highest in South Asia, 814 people per square mile. Even though the government of India has provided information about the benefits of small families, the total fertility rate (TFR) of the country is 3.2, and the growth rate is 1.7 percent per year. Modern medical and health practices have been successfully introduced into India resulting in a sharp decline in the mortality rate and an increase in the average life expectancy (from 32 years in 1947 to 61 years in 2001). The problem is compounded by a lack of a corresponding and significant decline in the fertility rate, though many developing countries have made great strides in the past 30 years to achieve fertility decline. The inevitable result has been an increasing strain on available resources by the population. This demand seriously threatens the socioeconomic development of the country. While India's population is second in size to China's, its annual population growth of 18 million leads the world. India's population is projected to reach 1.4 billion by 2025. Although practice of family planning in India has increased over a period of time, only 43 percentage of married women use modern methods of contraception as compared to 71 percent in the United States (Population Reference Bureau, 2001). Obviously, it is fertility, specifically fertility decline, not mortality, which needs to be examined to better understand India's population situation.

Among the developing countries, India was a pioneer in the international movement to control population growth and adopted a national population policy of fertility control as an integral part of its national developmental plan. The official recognition of the problem came with the publication of the First Five-year Plan (India, Planning Commission 1953), which went into effect in 1951. Since implementing the program, nine five-year plans have been completed and the tenth is underway. Unfortunately, the family planning program has not met with the success expected.

The promotion of family planning on a nationwide basis, associated with high standard of living, is the initial problem faced by the government of India. It appears that when people are accustomed to a high standard of living, they are inclined to limit family size in order to maintain this standard of living. However, in the case of India, for a majority of the population, the standard of living is low. Consequently, the country faces a dilemma. Whereas population control is critically needed to check the decline in the already low standard of living, the successful practice of family planning may require a higher standard of living than is now the case (Chandrasekhar 1967). Social researchers have studied the relationship between socioeconomic development and fertility many times at cross-national and subnational levels. This study investigates the relationship between the level of socioeconomic development and fertility among the states of India.

2. Theoretical Framework, Literature Review, and Hypothesis

The perspective of this research is taken essentially from the framework of one of the most contemporary theories of fertility control. This theory states that through economic development, social changes happen that allow for high fertility and mortality rates to be replaced by a decline in fertility and mortality rates, leading to population stability in any given society. This theory has been called the "Theory of Demographic Transition" in demography literature. Works by Thompson (1929), Notestein (1945), Davis (1949), Coale and Hoover (1958), and Stolnitz (1964) are some of the first demographers in recent years to set forth the use of the theory.

According to the demographic transition theory, in the past two centuries fertility and mortality decline in Europe and later elsewhere was largely the result of economic and social development. In the wake of this development came the rapid decline in mortality. With more children surviving, fewer births were needed to achieve a given family size or rate of population increase. The rising cost of living and diminished economic utility of children in urban and industrial environments provided additional motivation for family limitation. The rising status of women through the extension of educational opportunities and employment of women in occupations formerly reserved for males contributed to the widening practice of family limitation. Finally, along with industrialization and modernization, came the development of a more secular, rational attitude favoring the voluntary control of fertility (Caldwell 1982; Coale 1969; Teitelbaum 1975; and World Bank 1984).

Although the theory of demographic transition predicts a decline in fertility as a result of decreased mortality, increased socioeconomic development, and the decreased economic value of children, the exact factors responsible for the fertility decline in European societies are often debated. Freedman (1979: 4) notes "... detailed empirical work has been unable to establish combinations of development variables at specific levels which were systematically related to the European fertility declines." Regardless of differing viewpoints, today fertility is low in highly developed, industrialized countries. Based on Western Europe's experience on the evolution of the childhood role, some researchers predict that the same transition will be duplicated in today's developing countries (Ward 1984).

The low demand for children in developed societies results in low fertility. However, in developing countries, such as India, children play significant economic and old age security roles. A number of field studies have reported that children in many developing countries are a principal economic resource. They are economically active, contributing significantly to household labor in rural settings. Many of these children work in the formal labor force. In addition, children are viewed as a form of insurance for rural parents in old age (Bosserup 1981; Cain 1981; Mendelievich 1979; Rodgers and Standing 1981).

A number of studies have sought to clarify the complex relationship between socioeconomic development and fertility in developed and developing countries. Some researchers have stressed the effect of education, especially that of the mother, as the key factor in the declines in fertility in developing countries (Becker 1981; Schultz 1973). In India, studies have established a distinct relationship between the education of women and fertility. A negative association between the educational attainment of currently married women and fertility was observed in Greater Bombay (Rele and Kanitkar 1974). Another study conducted in the State of Kerala revealed the existence of fertility differentials by education, the differentials being more marked in respect to women's education (Mehrotra 1966). Increased schooling and postponement of marriage affects an individual's choice of marriage partner, son preference, knowledge of contraceptive methods, and ability to control the number of births. According to Caldwell (1980), mass education, that tends to emphasize modernization and secular attitudes, is the only means to enhance child survival and reduce fertility.

The economic activity of women with some education is also considered an important factor in reducing fertility (Cain 1984; Collver 1968; Ekanem 1972; Kasarda 1971; Ward and Pampel 1985). An increase in labor force participation rates enhances the status and power of women, which in turn enables them to limit fertility. The earning capacity of women is expected to bring an economic independence, which ultimately gives them more decision-making power. Furthermore, working women may have higher exposure to mass media and knowledge of family planning methods and services. However, in developing societies such as India, the working status of women in agricultural activity hardly changes their status in family and society and as a result has little effect on fertility decisions (Ward 1984). In developing countries, poverty rather than choice often forces women into the labor force (Youssef 1982).

Economic development, such as an increase in gross national product and per capita income of a society, is a significant factor inhibiting an effect on fertility (Heer 1966; Preston 1975; United Nations 1975). Economic development allows for an improved standard of living and higher aspirations for children and parents. In a developed society, the economic value and benefits of children decrease, resulting in lower fertility (Freedman 1979). Some variables indicating economic development, such as availability of water, electricity and toilet facilities, also affect fertility directly or indirectly through their impact on mortality. However, in India, the relationship between economic indicators and fertility was found to be very weak (Jain 1985).

A number of researchers have found that a decrease in infant and child mortality has a significant effect in lowering fertility. As the infant and child mortality rates in a society decrease, the parental motivation to replace dead children also decreases (Knodel 1974). A study by Taylor and Takulia (1971) in India found that the use of contraception is dependent on the respondent's perception of increased child survival. Furthermore, a couple's approval of contraception decreases in proportion to the number of child deaths (Rutstein 1974).

In developing countries such as India and China, family planning programs play a direct role in reducing fertility (Mauldin and Berelson 1978). The availability of effective contraception gives contemporary developing countries a major advantage over the European societies that underwent fertility decline earlier. Legalized abortion and other forms of birth control, trained family planning work force, statements by political leaders and public campaigns, and the use of mass media in developing countries have accelerated the diffusion of new ideas about family planning in both rural and urban environments creating conditions for fertility decline (Robey Rutstein and Morris 1993).

The preceding discussion forms the central orientation of this study; the underlying assumption behind the demographic transition theory is that as the level of development in a country increases, fertility decreases, bringing stability in population. Thus, this study will test the following major hypothesis: *The higher the level of socioeconomic development, the lower the fertility rates among the states of India.*

3. Data and Measurement

Data for the present study have been obtained from the National Family Health Survey (NFHS) initiated by the Ministry of Health and Family Welfare, Government of India, and conducted by the International Institute for Population Sciences, Bombay. Interviews were conducted with a nationally representative sample of 89,777 ever-married women, in the age group 13-49, from the 25 states of India. The main objective of the NFHS was to collect reliable and up-to-date information on fertility, family planning, mortality and maternal and child health. Data collection was carried out in three phases from April 1992 to September 1993. The NFHS is one of the most comprehensive surveys of its kind ever conducted in India. Its purpose is to strengthen the research capabilities of the 18 Population Research Centers located in universities and institutes of national repute throughout India (International Institute for Population Sciences 1995).

The two main concepts used in the research are (1) socioeconomic development (measure of independent variable), and (2) fertility (measure of dependent variable). The term "*socioeconomic development*" implies an ongoing process of change in a society and includes a large number of indicators (such as education, occupation, income, communication, transportation, energy, utilities infrastructures, and health) to describe the overall development of a society (Bongaarts 1978). However, in this study the following 24 variables are selected from the NFHS data of the states of India, which are grouped into four major categories: These are: (a) *Education variables:* (1) percentage of literate household population; (2) percentage of literate female; (3) percentage of household population aged 6-14 years attending school; (4) percentage of female aged 6-14 attending school; (5) median school years attained; and (6) percentage of women age 15-45 completing high school education and above; (b) *Modernization variables:* (7) percentage of urban population; (8) percentage of women age 20-24 years married before age 18; (9) percentage of women employed; (10) percentage of households with drinking facility from pipe or pump; (11) percentage of households with sanitary toilets; and (12) percentage of households with electricity; (c) *Health variables:* (13) infant mortality rate; (14) child mortality rate; (15) percentage of children immunized; (16) percentage of mothers receiving antenatal care; (17) percentage of mothers receiving tetanus toxoid vaccine; (18) percentage of births delivered in health facility; (19) percentage of deliveries assisted by health professionals; and (20) percentage of underweight children under 4 years; and (d) *Family planning variables:* (21) percentage of exposed to mass media; (22) percentage of having knowledge of

modern contraception; (23) percentage of using contraceptives; and (24) percentage of sterilized.

The term "*fertility*" refers to reproductive performance of a society. The two indicators of fertility are: (a) the crude birth rate (CBR) --the number of births per 1,000 population, and (b) the total fertility rate (TFR) --the average number of children born during a woman's reproductive span of life per woman, of the states of India. Table 1 shows the demographic and socioeconomic variables of the states of India, based on the NFHS data of 1992-1993.

Table 1
FERTILITY (CBR AND TFR) AND SOCIOECONOMIC DEVELOPMENT VARIABLES OF THE STATES OF INDIA, 1992-1993 NFHS

State	CBR	TFR	V1	V2	V3	V4	V5	V6	V7
Andhra Pradesh	24.2 (6)	2.6 (5)	49.4 (4)	38.5 (5)	63.3 (5)	54.8 (5)	0.0 (5)	10.4 (10)	26.1 (10)
Arunachal Pradesh	34.6 (24)	4.3 (24)	52.1 (6)	42.1 (7)	71.0 (10)	65.3 (9)	1.2 (6)	7.3 (5)	14.7 (1)
Assam	30.4 (18)	3.5 (18)	60.5 (11)	50.7 (10)	70.1 (8)	66.0 (10)	2.6 (9)	7.1 (3)	36.8 (21)
Bihar	32.1 (22)	4.0 (22)	44.6 (2)	28.6 (2)	51.3 (1)	38.3 (1)	0.0 (1)	8.1 (6)	21.3 (8)
Delhi	26.6 (13)	3.0 (13)	9.0 (22)	70.8 (21)	86.9 (19)	86.3 (19)	7.3 (25)	36.9 (25)	92.2 (25)
Goa	17.2 (1)	1.9 (1)	80.6 (23)	73.1 (23)	93.5 (24)	92.5 (24)	6.5 (23)	27.2 (24)	49.6 (24)
Gujarat	27.2 (15)	3.0 (14)	63.7 (14)	51.3 (11)	75.7 (12)	68.4 (11)	4.1 (14)	16.1 (19)	35.1 (19)
Haryana	32.9 (23)	4.0 (23)	59.9 (10)	45.9 (8)	81.3 (15)	74.7 (12)	3.4 (12)	14.4 (14)	35.2 (20)
Himachal Pradesh	28.2 (17)	3.0 (15)	67.9 (18)	57.4 (17)	90.8 (23)	87.6 (21)	4.6 (18)	13.4 (12)	31.4 (14)
Jammu	27.9 (16)	3.1 (16)	63.1 (12)	51.8 (12)	85.7 (18)	79.6 (18)	4.5 (17)	18.8 (21)	34.2 (17)
Karnataka	25.9 (10)	2.9 (10)	57.4 (8)	46.5 (9)	70.5 (9)	64.4 (8)	2.9 (10)	13.6 (13)	32.7 (16)
Kerala	19.6 (2)	2.0 (2)	86.0 (24)	82.4 (24)	94.8 (25)	94.8 (25)	6.7 (24)	21.3 (22)	28.1 (13)
Madhya Pradesh	31.6 (20)	3.9 (21)	49.8 (5)	34.3 (4)	62.3 (4)	54.8 (4)	0.0 (4)	7.3 (4)	23.6 (9)
Maharashtra	26.3 (11)	2.9 (11)	67.9 (17)	55.9 (15)	81.5 (16)	76.6 (14)	4.5 (16)	14.8 (16)	41.4 (22)
Manipur	24.4 (7)	2.8 (7)	74.0 (20)	63.0 (19)	90.2 (21)	86.8 (20)	5.1 (20)	22.6 (23)	32.2 (15)
Meghalaya	31.9 (21)	3.7 (20)	63.6 (13)	60.2 (18)	75.0 (11)	75.7 (13)	2.5 (8)	10.4 (11)	19.4 (2)
Mizoram	20.8 (3)	2.3 (3)	91.1 (25)	88.9 (25)	90.7 (22)	88.5 (22)	5.9 (22)	14.6 (15)	49.5 (23)
Nagaland	31.3 (19)	3.3 (17)	75.8 (21)	71.8 (22)	89.6 (20)	89.0 (23)	5.1 (21)	15.8 (18)	20.9 (7)

(Continued)

(*Continuation* – Table 1)

State	CBR	TFR	V1	V2	V3	V4	V5	V6	V7
Orrissa	26.5 (12)	2.9 (12)	55.2 (7)	41.4 (6)	69.6 (7)	62.0 (6)	1.8 (7)	6.0 (2)	26.4 (11)
Punjab	25.0 (8)	2.9 (8)	59.2 (9)	52.0 (13)	80.8 (14)	77.8 (16)	4.1 (15)	18.3 (20)	27.9 (12)
Rajasthan	27.0 (14)	3.6 (19)	43.9 (1)	25.4 (1)	58.8 (2)	40.6 (2)	0.0 (2)	4.9 (1)	19.6 (3)
Tamil Nadu	23.5 (5)	2.5 (4)	66.4 (16)	56.1 (16)	82.4 (17)	78.7 (17)	5.0 (19)	15.2 (17)	34.7 (18)
Tripura	23.1 (4)	2.7 (6)	72.8 (19)	64.4 (20)	79.4 (13)	76.7 (15)	3.9 (13)	8.6 (7)	20.1 (4)
Uttar Pradesh	35.9 (25)	4.8 (25)	48.0 (3)	31.5 (3)	61.3 (3)	48.2 (3)	0.0 (3)	8.8 (8)	20.4 (5)
West Bengal	25.5 (9)	2.9 (9)	65.6 (15)	52.2 (14)	67.7 (6)	62.9 (7)	3.3 (11)	9.6 (9)	20.8 (6)
Mean	27.2	3.1	63.9	53.6	77.0	71.6	3.4	14.1	31.8
Std Deviation	4.6	0.7	12.7	16.2	12.0	15.8	2.3	7.4	15.5

(Continued)

(*Continuation* – Table 1)

State	V8	V9	V10	V11	V12	V13	V14	V15	V16
Andhra Pradesh	68.6 (4)	53.4 (24)	63.4 (12)	24.4 (8)	62.2 (11)	70.4 (10)	22.4 (13)	45.0 (13)	86.3 (20)
Arunachal Pradesh	43.9 (12)	44.9 (19)	75.8 (20)	73.6 (20)	63.1 (13)	40.0 (21)	33.3 (6)	22.5 (8)	48.9 (5)
Assam	44.4 (11)	18.4 (3)	43.2 (3)	49.6 (17)	20.4 (2)	88.7 (4)	58.7 (1)	19.4 (5)	49.3 (6)
Bihar	69.1 (3)	24.9 (6)	63.6 (13)	16.5 (3)	16.6 (1)	89.2 (3)	42.0 (4)	10.7 (3)	36.8 (2)
Delhi	28.7 (16)	19.3 (4)	99.5 (25)	84.1 (24)	95.5 (25)	65.4 (13)	19.0 (18)	57.8 (19)	82.4 (17)
Goa	7.2 (25)	29.7 (11)	92.5 (23)	43.5 (16)	91.7 (23)	31.9 (22)	7.2 (24)	74.9 (25)	95.4 (24)
Gujarat	33.4 (15)	43.2 (17)	75.1 (18)	35.8 (12)	76.6 (18)	68.7 (11)	37.9 (5)	49.8 (14)	75.7 (14)
Haryana	57.3 (6)	28.9 (10)	73.0 (15)	26.9 (9)	85.0 (20)	73.3 (8)	27.4 (9)	53.5 (15)	72.7 (12)
Himachal Pradesh	24.2 (18)	47.7 (22)	57.6 (11)	12.6 (2)	90.2 (22)	55.8 (16)	14.1 (22)	62.9 (21)	76.0(15)
Jammu	20.5 (19)	27.5 (9)	57.3 (9)	19.1 (4)	86.7 (21)	45.4 (19)	14.3 (21)	65.7 (24)	79.5 (16)
Karnataka	51.2 (9)	47.0 (21)	75.6 (19)	31.2 (11)	64.0 (15)	65.4 (14)	23.5 (12)	57.2 (18)	83.5 (19)
Kerala	19.3 (20)	24.7 (5)	21.0 (1)	70.9 (19)	60.3 (9)	23.8 (23)	8.4 (23)	54.4 (16)	97.3 (25)
Madhya Pradesh	73.3 (1)	32.4 (13)	55.8 (8)	21.3 (6)	62.4 (12)	85.2 (5)	49.3 (2)	29.2 (10)	52.1 (8)
Maharashtra	53.9 (8)	49.0 (23)	78.5 (21)	40.8 (15)	73.6 (16)	50.5 (18)	20.9 (15)	64.1 (22)	82.7 (18)
Manipur	14.3 (23)	53.5 (25)	47.0 (5)	83.1 (23)	62.1 (10)	42.4 (20)	20.2 (16)	29.1 (9)	63.4 (10)
Meghalaya	28.1 (17)	41.8 (16)	47.6 (6)	54.3 (18)	42.6 (6)	64.2 (15)	24.3 (11)	9.7 (2)	51.8 (7)
Mizoram	13.3 (24)	33.2 (15)	40.1 (2)	98.3 (25)	76.0 (17)	14.6 (25)	14.9 (20)	56.4 (17)	88.9 (22)
Nagaland	16.4 (21)	43.7 (18)	72.1 (14)	79.3 (21)	76.9 (19)	17.2 (24)	3.6 (25)	3.8 (1)	39.3 (3)
Orrissa	45.5 (10)	25.9 (8)	50.9 (7)	12.2 (1)	27.8 (3)	112.1 (1)	21.3 (14)	36.1 (12)	61.6 (9)
Punjab	14.9 (22)	7.7 (1)	98.6 (24)	36.7 (13)	92.0 (24)	53.7 (17)	15.0 (19)	61.9 (20)	87.9 (21)

(Continued)

(*Continuation* – Table 1)

State	V8	V9	V10	V11	V12	V13	V14	V15	V16
Rajasthan	69.5 (2)	31.4 (12)	57.3 (10)	19.8 (5)	51.9 (8)	72.6 (9)	32.3 (7)	21.1 (7)	31.2 (1)
Tamil Nadu	36.1 (14)	46.7 (20)	74.6 (17)	29.4 (10)	63.8 (14)	67.7 (12)	20.1 (17)	64.9 (23)	94.2 (23)
Tripura	41.1 (13)	25.7 (7)	44.1 (4)	79.4 (22)	45.1 (7)	75.8 (6)	31.2 (8)	19.0 (4)	64.9 (11)
Uttar Pradesh	63.9 (5)	13.4 (2)	74.3 (16)	22.9 (7)	31.9 (4)	99.9 (2)	46.0 (3)	19.8 (6)	44.7 (4)
West Bengal	56.4 (7)	33.0 (14)	84.9 (22)	40.4 (14)	32.9 (5)	75.3 (7)	26.0 (10)	34.2 (11)	75.3 (13)
Mean	39.8	33.9	64.9	44.2	62.1	62.0	25.3	40.9	68.9
Std Deviation	20.6	12.6	19.2	26.2	23.4	24.8	13.5	21.2	19.8

(Continued)

(*Continuation* – Table 1)

State	V17	V18	V19	V20	V21	V22	V23	V24
Andhra Pradesh	74.8 (21)	32.8 (17)	49.3 (18)	49.1 (10)	75.2 (21)	96.6 (11)	47.0 (11)	44.8 (22)
Arunachal Pradesh	31.9 (4)	19.9 (10)	21.3 (5)	39.7 (19)	46.6 (9)	77.7 (3)	23.6 (5)	10.7 (4)
Assam	34.9 (6)	11.1 (2)	17.9 (3)	50.4 (8)	39.1 (4)	96.9 (12)	42.8 (10)	4.4 (1)
Bihar	30.7 (3)	12.1 (5)	9.0 (1)	62.6 (1)	29.5 (1)	94.9 (8)	23.1 (4)	18.6 (7)
Delhi	72.5 (20)	44.3 (21)	53.0 (20)	41.6 (17)	86.7 (25)	98.9 (20)	60.3 (24)	23.3 (9)
Goa	83.4 (23)	86.8 (24)	88.4 (24)	35.0 (21)	85.2 (24)	98.8 (18)	47.8 (12)	30.5 (12)
Gujarat	62.7 (14)	35.6 (18)	42.5 (16)	50.1 (9)	55.4 (10)	96.4 (10)	49.3 (14)	41.0 (19)
Haryana	63.3 (15)	16.7 (9)	30.3 (10)	37.9 (20)	60.1 (11)	99.4 (22)	49.7 (16)	34.8 (17)
Himachal Pradesh	47.4 (10)	16.0 (8)	25.6 (8)	47.0 (13)	66.8 (17)	98.9 (19)	58.4 (22)	45.8 (23)
Jammu	68.9 (16)	21.9 (11)	31.2 (11)	44.5 (16)	72.2 (20)	99.6 (23)	49.4 (15)	29.7 (11)
Karnataka	69.8 (17)	37.5 (19)	50.9 (19)	54.3 (5)	70.1 (19)	98.8 (17)	49.1 (13)	42.5 (20)
Kerala	89.8 (24)	87.8 (25)	89.7 (25)	28.5 (24)	79.2 (23)	99.7 (13)	63.3 (25)	48.3 (25)
Madhya Pradesh	42.8 (9)	15.9 (7)	30.0 (9)	57.4 (3)	41.0 (6)	87.8 (5)	36.5 (9)	31.5 (14)
Maharashtra	71.0 (19)	43.9 (20)	53.2 (21)	54.2 (6)	62.8 (14)	97.8 (14)	53.7 (18)	46.2 (24)
Manipur	48.0 (11)	23.0 (12)	40.4 (15)	30.1 (22)	67.8 (18)	93.0 (7)	34.9 (7)	13.8 (6)
Meghalaya	30.0 (2)	29.6 (14)	36.9 (14)	45.5 (15)	46.4 (8)	76.9 (2)	20.7 (3)	10.0 (3)
Mizoram	42.5 (8)	48.9 (22)	61.5 (22)	28.1 (25)	61.3 (12)	98.1 (15)	53.8 (19)	44.6 (21)
Nagaland	33.0 (5)	6.0 (1)	22.2 (7)	28.7 (23)	44.6 (7)	44.3 (1)	13.0 (1)	6.4 (2)
Orrissa	53.8 (12)	14.1 (6)	20.5 (4)	53.3 (7)	39.5 (5)	92.5 (6)	36.3 (8)	31.6 (15)
Punjab	82.7 (22)	24.8 (13)	48.3 (17)	45.9 (14)	65.5 (15)	99.8 (25)	58.7 (23)	34.0 (16)

(Continued)

(*Continuation* – Table I)

State	V17	V18	V19	V20	V21	V22	V23	V24
Rajasthan	28.3 (1)	11.6 (4)	21.8 (6)	41.6 (18)	30.1 (2)	87.2 (4)	31.8 (6)	27.7 (10)
Tamil Nadu	90.1 (25)	63.4 (23)	71.2 (23)	48.2 (12)	78.0 (22)	99.1 (21)	49.8 (17)	39.5 (18)
Tripura	58.7 (13)	30.7 (15)	33.5 (13)	48.8 (11)	65.5 (16)	99.7 (24)	56.1 (20)	19.1 (8)
Uttar Pradesh	37.4 (7)	11.2 (3)	17.2 (2)	59.0 (2)	35.5 (3)	95.2 (9)	19.8 (2)	13.1 (5)
West Bengal	70.4 (18)	31.5 (16)	33.0 (12)	56.8 (4)	61.3 (13)	98.8 (16)	57.4 (21)	30.6 (13)
Mean	56.8	31.1	40.0	45.5	58.6	93.0	43.5	28.9
Std Deviation	20.2	21.9	21.2	10.0	17.0	12.0	14.5	13.7

Source : International Institute for Population Sciences (IIPS), 1992-1993 National Family Health Survey. Bombay, India: IIPS, 1995.

Note : Dependent Variables: CBR = Crude Birth Rate, and TFR = Total Fertility Rate.
Independent Variables: (a) ***Education variables***: (V1) percentage of literate household population, (V2) percentage of literate females, (V3) percentage of household population aged 6-14 years attending school, (V4) percentage of female age 6-14 attending school, (V5) median school years attained, and (V6) percentage of women aged 13-49 completing high school education or above; (b) ***Modernization variables***: (V7) percentage of urban population, (V8) percentage of women aged 20-24 years married before age 18, (V9) percentage of women age 13-49 employed, (V10) percentage of households with drinking water facility from pipe or pump, (V11) percentage of households with sanitary toilets, and (V12) percentage of households with electricity; (c) ***Health variables:*** (V13) Infant mortality rate, (V14) Child mortality rate, (V15) percentage of children immunized, (V16) percentage of mothers receiving antenatal care, (V17) percentage of mothers receiving tetanus toxoid, (V18) percentage of births delivered in a health facility, (V19) percentage of deliveries assisted by health professionals, and (V20) percentage of underweight children under 4 years: (d) ***Family Planning variables***: (V21) percentage of exposed to mass media, (V22) percentage of having knowledge of modern contraception (V23) percentage of using contraceptives, and (V24) percentage of sterilized.

Numbers in parentheses indicate the ranks of the respective values of the fertility rates (crude birth rate and total fertility rate) and socioeconomic development variables (education, modernization, health, and family planning).

4. Analysis of Data and Results

The analysis of data and results presented below is based on three commonly used statistical procedures, appropriate for the respective levels of measurement for the variables used. (1) Pearson's correlation coefficient measures the association between the interval level variables. (2) Spearman's correlation coefficient measures the association between the composite ordinal level variables. (3) Multiple regression analysis models the interval fertility variables using the predictor variables of socioeconomic development.

(1) *Pearson's correlation coefficients*: Table 2 presents Pearson correlation coefficients between socioeconomic development variables and fertility rates (CBR and TFR) in India. An examination of the data shows that of the total 24 socioeconomic development variables, 21 variables are related to both the crude birth rate and the total fertility rate in the direction predicted by demographic transition theory. Of these, 17 are statistically significant at the 1 percent or 5 percent level. These results confirm the major hypothesis that the higher the level of socioeconomic development, the lower the fertility rates among the states of India. The results of the four major categories of socioeconomic development and fertility rates are as follows:

(a) Education: Among the six education variables, all are correlated in the predicted direction with both the crude birth rate and the total fertility rate. Of these, five are statistically and significantly correlated at the 1 percent level, including the percentage of literate population (-0.634 and -0.700), percentage of literate female (-0.608 and -0.688), percentage of attending school (-0.528 and -0.625), percentage of female attending school (-0.512 and -0.628), and median school years attained (-0.607 and -0.692). The variable percentage of women aged 15-45 completing high school education or above (-0.459 and –0.494) are statistically and significantly correlated at the 5 percent level.

(b) Modernization: Among the six modernization variables, all but one is correlated in the predicted direction with both the crude birth rate and the total fertility rate. Of the five variables correlated, only one percent of women, married before age 18, is statistically significant at the 5 percent level with the crude birth rate and at the 1 percent level with the total fertility rate. The variables percentage of urban population (-0.349 and -0.370), percentage of women employed (-0.076 and –0.188), percentage of households with sanitary toilets (-0.268 and -0.281), and percentage of households with

electricity (-0.307 and –0.365) show a negative association with the crude birth rate and the total fertility rate, but are not statistically and significantly. On the other hand, the variable percentage of households with drinking water facility from pipe or pump (0.096 and 0.104) has relatively weak association and not in the expected direction with the crude birth rate and the total fertility rate.

Table 2
PEARSON'S CORRELATION COEFFICIENTS BETWEEN SOCIOECONOMIC DEVELOPMENT VARIABLES AND FERTILITY RATES IN INDIA, 1992-1993 NFHS

Socio-economic Development Variables	Crude Birth Rate	Total Fertility Rate
(a) Education		
1. Percentage of literate population	-0.634 **	-0.700 **
2. Percentage of literate females	-0.608 **	-0.688 **
3. Percentage of attending school	-0.528 **	-0.625 **
4. Percentage of female attending school	-0.512 **	-0.628 **
5. Median school years attained	-0.607 **	-0.692 **
6. Percentage of completing high school education or above	-0.459 *	-0.494 *
(b) Modernization		
7. Percentage of urban population	-0.349	-0.370
8. Percentage of married women before age 18	0.483 *	0.568 **
9. Percentage of employed women	-0.076	-0.188
10. Percentage of households with drinking water facility	0.096	0.104
11. Percentage of households with sanitary toilets	-0.268	-0.281
12. Percentage of households with electricity	-0.307	-0.365
(c) Health		
13. Infant mortality rate	0.425 *	0.478 *
14. Child mortality rate	0.572 **	0.659 **
15. Percentage of children immunized	-0.585 **	-0.604 **
16. Percentage of mothers receiving antenatal care	-0.736 **	-0.777 **
17. Percentage of mothers receiving tetanus toxoid vaccine	-0.668 **	-0.689 **
18. Percentage of birth delivered in health facility	-0.778 **	-0.744 **
19. Percentage of deliveries assisted by health professionals	-0.809 **	-0.790 **
20. Percentage of underweight children under 4 years	0.387	0.408 *
(d) Family planning		
21. Percentage of exposed to mass media	-0.696 **	-0.742 **
22. Percentage of having knowledge of modern contraception	-0.414 *	-0.311
23. Percentage of using contraceptives	-0.660 **	-0.670 **
24. Percentage of sterilized	-0.548 **	-0.561 **

Notes: ** Indicates a correlation coefficient which is significant at 0.01 level, two-tailed test.
* Indicates a correlation coefficient which is significant at 0.05 level, two tailed-test.

(c) Health: Among the eight health variables, all are correlated in the predicted direction with both the crude birth rate and the total fertility rate. Of these, six variables have statistically significant relationship at the 1 percent

level, including the child mortality rate (0.572 and 0.659), percentage of children immunized (-0.585 and -0.604), percentage of mothers receiving antenatal care (-0.736 and -0.777), percentage of mothers receiving tetanus toxoid vaccine (-0.668 and –0.689), percentage of birth delivered in health facility (-0.778 and -0.744), and percentage of deliveries assisted by health professionals (-0.809 and –0.790). Of the remaining two variables, infant mortality rate (0.425 and 0.478) is statistically and significantly correlated at the 5 percent level with both the crude birth rate and the total fertility rate while the variable percentage of underweight children under four years (0.387 and 0.408) has statistically significant correlation at 5 percent level only with the total fertility rate.

(d) Family Planning: Among the four family planning variables, all are correlated in the predicted direction with both the crude birth rate and the total fertility rate. Of these, three are statistically significant at the 1 percent level, including percentage of exposed to mass media (-0.696 and -0.742), percentage of using contraceptives (-0.660 and -0.670), and percentage of sterilized (-0.549 and -0.562). The variable percentage of having knowledge of modern contraception (-0.414 and -0.311) is statistically significantly correlated at the 5 percent level with the crude birth rate, but is not statistically significant with the total fertility rate.

(2) *Spearman's correlation coefficients*: In this study an attempt is made to devise a composite measure of each measure category of the socioeconomic development, including education, modernization, health, and family planning. Although the variables comprising the composite measures are varied, they represent equally weighted aspects of the broad constructs of the level of development used by demographers (Amonker 1975; Population Crisis Committee 1988; United Nations 1991).

The composite measure of each category of the socioeconomic development is calculated by ranking all the states of India with respect to socioeconomic development variables--that is, ranked within each variable with highest development value receiving a rank of 25 and the lowest development value receiving a rank of 1. Thus, each state has a rank for each variable as shown in Table 1. The composite measure of each category is obtained by summing up the ranks of values of each variable within that category as shown in Table 3. Furthermore, the states are ranked for each measure category of socioeconomic development as shown in parentheses. Similarly, all the states of India are ranked with respect to each measure of fertility—that is, ranked within each measure with lowest rate receiving a rank of 1 and the highest rate receiving a rank of 25.

Spearman's Rho measures the degree of association between the four composite rankings of socioeconomic development and each ranking of fertility. Table 4 presents Spearman's correlation coefficients with the crude birth rate and the total fertility rate. An examination of the data shows that all of the major categories of socioeconomic development have negative association with the crude birth rate and the total fertility rate as predicted by the demographic transition theory. Of the four major categories, three are statistically significant at the 1 percent level, including education (-0.546 and -0.611), health (-0.734 and -0.780), and family planning (-0.604 and -0.616). The category of modernization (-0.420 and -0.476) is statistically significant at the 5 percent level.

Table 3
COMPOSITE MEASURES OF SOCIOECONOMIC DEVELOPMENT OF THE STATES OF INDIA, BY MAJOR CATEGORIES, 1992-1993 NFHS

State	Education	Modernization	Health	Family Planning
Andhra Pradesh	34 (5)	69 (11)	122 (16)	65 (13)
Arunachal Pradesh	43 (7)	85 (14)	78 (7)	21 (5)
Assam	51 (8)	57 (6)	35 (3)	27 (7)
Bihar	13 (2)	34 (1)	22 (1)	20 (4)
Delhi	131 (22)	119 (24)	145 (21)	78 (21)
Goa	141 (24)	122 (25)	187 (25)	66 (15)
Gujarat	81 (13)	99 (19)	101 (13)	53 (11)
Haryana	71 (11)	80 (13)	98 (12)	66 (14)
Himachal Pradesh	109 (19)	89 (15)	113 (14)	81 (24)
Jammu	98 (17)	79 (12)	134 (18)	69 (19)
Karnataka	57 (9)	91 (16)	123 (17)	69 (18)
Kerala	144 (25)	67 (9)	185 (24)	86 (25)
Madhya Pradesh	25 (4)	49 (5)	53 (4)	34 (9)
Maharashtra	94 (16)	105 (22)	139 (19)	70 (20)
Manipur	123 (20)	101 (21)	115 (15)	38 (10)
Meghalaya	74 (12)	65 (8)	80 (8)	16 (2)
Mizoram	131 (23)	106 (23)	161 (23)	67 (16)
Nagaland	125 (21)	100 (20)	89 (10)	11 (1)
Orrissa	35 (6)	40 (4)	65 (6)	34 (8)
Punjab	87 (14)	96 (18)	143 (20)	79 (23)
Rajasthan	9 (1)	40 (3)	53 (5)	22 (6)
Tamil Nadu	102 (18)	93 (17)	158 (22)	78 (22)
Tripura	87 (15)	57 (7)	81 (9)	68 (17)
Uttar Pradesh	23 (3)	39 (2)	29 (2)	19 (3)
West Bengal	62 (10)	68 (10)	91 (11)	63 (12)

Note: The composite measure of each category, including education, modernization, health, and family planning is obtained by summing up the ranks of values of each variable as shown in Table 1.

Table 4
SPEARMAN'S CORRELATION COEFFICIENTS BETWEEN THE COMPOSITE MEASURES OF THE SOCIOECONOMIC DEVELOPMENT AND FERTILITY RATES IN INDIA 1992-1993 NFHS

Socioeconomic Development	Crude Birth Rate	Total Fertility Rate
1. Education	- 0.546 **	- 0.611 **
2. Modernization	-.0.420 *	- 0.476 *
3. Health	- 0.734 **	- 0.780 **
4. Family planning	- 0.604 **	- 0.616 **

Notes: ** Indicates a correlation coefficient which is significant at 0.01 level, two-tailed test
* Indicates a correlation coefficient which is significant at 0.05 level, two tailed test

(3) *Multiple regression analysis*: Finally, in an effort to explore the importance of specific variables of socioeconomic development with each measure of fertility, a multiple regression analysis was carried out. The results presented in Table 5 include: (a) standardized regression coefficients (Beta); (b) the values of t statistics corresponding to each coefficient estimate; (c) the values of t significance; (d) the values of the R square, the overall fitness of the model, and (e) the values of F statistics.

Model A uses these two measures of socioeconomic development, percentage of literate females and percentage of using contraceptives, to explain 56.5 percent of the variance in the crude birth rate. The F ratio (14.300) is significant at the 0.1 level. The Beta coefficient indicates that percentage of using contraceptives (-0.489) is slightly stronger predictor of the crude birth rate, with a t statistic significant at the 1 percent level. The theoretical effect of contraceptive use on fertility is highly intuitive. However, the relatively high Beta coefficient for percentage of literate females (-0.399), significant at the 5 percent level, suggests that it also explains a substantial portion of the variance in the crude birth rate.

Table 5
MULTIPLE REGRESSION ANALYSIS BETWEEN SOCIOECONOMIC DEVELOPMENT VARIABLES AND FERTILITY RATES (CBR AND TFR) IN INDIA, BY MODELS

Socioeconomic Development Variables	Crude Birth rate			Total Fertility Rate		
	Beta	t	Sig.	Beta	t	Sig.
1. Percentage of literate females	-0.399	-2.565	0.018	-0.491	-3.501	0.002
2. Percentage of using contraceptives	-0.489	-3.146	0.018	-0.460	-3.279	0.003
	Constant = 40.091			Constant = 5.243	R Square = 0.646	
	R Square = 0.565			F = 20.075 ***		
	F = 14.300 ***			N = 25		
	N = 25					

Note: *** Indicates significant at 0.001 level, two-tailed test.

Model B utilizes the same two measures of socioeconomic development to explain 64.6 percent of the variance in the total fertility rate. This model exhibits an even higher F ratio (20.075) significant at the 0.1 percent level. Unlike Model A, the Beta coefficients for Model B indicate the percentage of literate females explains more of the variance in the total fertility rate, though percentage of using contraceptives is also relatively strong predictor of the total fertility rate. The t statistics for both independent variables are significant at the 1 percent level. The regression analysis suggests that two variables, percentage of literate females and percentage of using contraceptives, explain over half of the variance in both the crude birth rate and the total fertility rate. These models support the popular interpretation of the demographic transition theory, suggesting that high levels of contraception use have the effect of lowering fertility rates. However, educational empowerment of women is critical for encouraging contraception use among families of India.

5. Conclusion

Although the states of India differ widely in socioeconomic characteristics and fertility rates, the findings of this study support the demographic transition theory in large measure revealing a correlation between 21 of the 24 socioeconomic development variables and fertility in the predicted direction. The study supports the hypothesis that the overall level of health care, education, and modernization accompanied by ready access to family planning information and services, play a significant role in lowering

fertility. Finally, the study suggests that higher levels of female literacy and acceptance of contraceptives lead to fertility decline.

Governmental policies around the world have historically been directed at influencing variables having positive impacts on mortality, such as improving healthcare, sanitation, and prenatal care. The governments of early developing societies of seventeenth century Western Europe reduced levels of mortality without much thought about the residual population explosions that would occur shortly thereafter. Relatively low population levels, as well as outlets associated with migration opportunities, precluded a need for concerted efforts to reduce fertility, and these societies were able to absorb this growth as the natural forces of demographic transition tended to reduce fertility. However, the situation is very different for societies undergoing industrialization today. Not only do they already have relatively high population densities, but also outlets for migration to less densely populated regions are not as readily available. As world population levels, and specifically population levels in selective areas of high density and growth such as India, reach levels that are increasingly being defined as unsustainable, government policies directed at reducing fertility are becoming more and more necessary.

These results have several important policy implications for reducing the rate of population growth in India. Government policies aimed at improving the educational levels of women, improving child and infant health, creating basic awareness about population problems through mass media, and providing effective family planning services, should have a significant impact on population growth.

The study reinforces the theme "Population and Development," adopted by the third once-in-a-decade International World Population Conference held in Cairo, Egypt in 1994 (United Nations 1994). The Cairo conference represents a significant change in thinking about population shifting in emphasis from family planning to development. In addition, the Program of Action covers a wide range of topics that reach into every aspect of human existence, such as infant and maternal mortality, education, status of women, family relationships, poverty, urban development, reproductive health care, and family planning. While population policies and programs have long been equated with family planning and fertility control, the Cairo Program of Action addresses the social dynamics involved in formulating these policies by emphasizing population control within the context of socioeconomic development, particularly the socioeconomic development of women. The Program of Action asserts that population growth can be stabilized and

development efforts enhanced by the emancipation of women--i.e. by providing women with education, expanding the value of the female children, legislating gender equality, and promoting equal access to economic and political power. In addition, the Plan of Action emphasizes the promotion and expansion not only of family planning programs, but also reproductive health programs to bring about a decline in fertility.

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