

PN ABGL-245 85199

The EVALUATION Project

Document #WP-O-07

July 1993

REGULATING REPRODUCTION IN INDIA'S POPULATION

62

Efforts, Results, and Recommendations

K. Srinivasan
Senior Fellow

Support for this paper was provided by USAID Contract # DPE-3060-C-00-1054-00
"Evaluation of Family Planning Program Impact"

Carolina Population Center

University of North Carolina at Chapel Hill

Tulane University

The Futures Group

Contract #DPE-3060-C-00-1054-00

TABLE OF CONTENTS

List of Tables	vi
List of Figures	xi
Preface	xii
Chapter 1	
POPULATION CONCERNS BEFORE INDEPENDENCE	1
Chapter 2	
POPULATION POLICIES AND PROGRAMS SINCE INDEPENDENCE	9
PLANNING IN INDIA	9
OFFICIAL POPULATION POLICIES AND PROGRAMS	11
The First Five-Year Plan 1951-56	12
The Second Five-Year Plan 1956-61	12
The Third Five-Year Plan 1961-66	14
The Fourth Five-Year Plan 1969-74	16
The Fifth Five-Year Plan 1974-79	17
The Sixth Five-Year Plan, 1980-85	20
Long-term goals	24
Short-term goals	24
The Seventh Five-Year Plan 1986-91	26
The Eighth Five-Year Plan, 1992-97	31
Chapter 3	
NATURAL FERTILITY AND NUPTIALITY	33
VALUES RELATED TO FERTILITY AND PROXIMATE VARIABLES	33
HISTORICAL NATURAL FERTILITY LEVELS	35
NUPTIALITY LEVELS	41
MODERNIZATION AND NATURAL FERTILITY CHANGES	44
Modernization and Changes in Natural Fertility	47
Empirical Support for Increased Natural Fertility Levels in India during the 1950s and 1960s	48
MODERNIZATION AND CHANGES IN NUPTIALITY PATTERNS	53
Chapter 4	
DEMOGRAPHIC AND DEVELOPMENTAL CHANGES	56
CULTURAL BACKGROUND TO DIVERSITY	56
TRENDS IN BASIC DEMOGRAPHIC PARAMETERS	57
Size	57
Growth Rate	57
Sex Ratio	61
Age Structure	63
Mortality	64
Fertility	68
Urbanization	70
TRENDS AND DETERMINANTS IN MORTALITY PATTERNS	72

2

COMPARISON OF OTHER STATES WITH CONDITIONS IN KERALA: TIME LAGS IN DEVELOPMENT	79
INDIA'S DEVELOPMENT IN COMPARISON WITH OTHER LARGE DEVELOPING COUNTRIES	83
Industrial Production	84
Literacy and Education	86
 Chapter 5	
ACCEPTANCE AND USE OF CONTRACEPTION	91
CONCEPTS OF ACCEPTANCE AND USE IN THE INDIAN PROGRAMS	92
ACCEPTORS: TRENDS AND DIFFERENTIALS	93
Changing Method Mix over Time	93
Targets and Achievement	94
CHARACTERISTICS OF ACCEPTORS	97
Age and Number of Children at Time of Acceptance	97
Rural-Urban Differentials	102
CONTRACEPTIVE USE	104
Couple Protection Rate: State Level	104
District Level Percentage of Couples Effectively Protected (CEP)	110
Relationship between CEP and Literacy Levels	112
Contraceptive Prevalence Rate (CPR)	112
EFFECT OF FAMILY PLANNING PROGRAM COMPONENTS ON ACCEPTANCE AND USE ..	122
PROGRAM IMPACTS AND ACCEPTANCE: FINDINGS FROM A FOUR-STATE STUDY	125
Methodology	125
Results	128
Program Input and Socioeconomic Conditions	128
Program Performance and Socioeconomic Conditions	131
Impact of Program Inputs on Family Planning Acceptance	132
 Chapter 6	
MODERNIZATION, CONTRACEPTION, AND FERTILITY DECLINE	135
OBSERVED FERTILITY CHANGES AND DATA SOURCES	137
DEMOGRAPHIC COMPONENTS OF FERTILITY CHANGES	142
CONTRACEPTIVE USE AND FERTILITY DECLINE	144
MULTIVARIATE ANALYSIS	148
SPACING AND LIMITATION PATTERNS	160
Tempo	160
Quantum	161
RECENCY OF BIRTH AND CONTRACEPTIVE USE	162
 Chapter 7	
CASE STUDIES OF THREE SUCCESSFUL FERTILITY TRANSITION STATES: GOA, KERALA, AND TAMIL NADU	168
THE CASE STUDY OF GOA	176
Background	176
Population Size and Rate of Growth	178
Socioeconomic and Demographic Indicators	178
Nuptiality Patterns	180
Fertility and Mortality Trends	183
Family Planning Practice and Lessons	183
THE CASE STUDY OF KERALA	185
Background	185

v

Social Justice and Equity Hypothesis	191
Political Capacity or Degree of Government Hypothesis	191
Socioeconomic Determinants	192
The Malthusian Hypothesis	193
The Four Hypotheses	194
THE CASE STUDY OF TAMIL NADU	195
Background	195
The Self-Respect Movement in Tamil Nadu	195
Population Growth and Fertility Trends	196
Political Will and Bureaucracy	201
Social and political will	201
Bureaucratic efficiency	201
Effective communication strategies	203
SOME TENTATIVE LESSONS FROM THE CASE STUDIES	205
Chapter 8	
CRITICAL ISSUES AND RECOMMENDATIONS	208
OVERVIEW OF THE PROBLEM	208
SUPPLY SIDE ISSUES	210
Political Will	210
Population Policy Formulation at State Level	211
Strategic Planning for Shifting Emphasis from Sterilization to Spacing Methods	212
Selective Targeting Strategy: the Birth-Based Approach	214
Improving Program Management	215
Bureaucratic Efficiency	218
The Four M's	219
Technical Cooperation	219
Monitoring Information and Evaluation System	220
Maximum Use of Personnel	220
Skills Upgrading	220
DEMAND SIDE ISSUES	221
Improving Literacy Levels	221
Programs for Improving Child Survival	221
APPENDIX A. National Population Policy: A Statement of the Government of India	223
APPENDIX B. Family Welfare Programme: A Statement of Policy	228
APPENDIX C. Trends in Agricultural Production in India	232
APPENDIX D. Changes in Selected Economic Characteristics of 12 Large Developing Countries	233
APPENDIX E. Trends in Industrial Production in India	234
APPENDIX F. Trends in Index Values of Industrial Production	235
APPENDIX G. Glossary of Terms	236
BIBLIOGRAPHY	240

-C-

List of Tables

- 2.1 **Desired Demographic Goals: India, 1962-97**
- 2.2 **Governmental Expenditure on Family Planning Programs: India, 1951-91**
- 2.3 **Family Planning Incentives Offered by Central Government: India, 1964-83**
- 2.4 **Program Effort Scores on Family Planning Program Components and Contraceptive Prevalence Rate for 1990: 12 Large Nations, 1982 and 1989**
- 3.1 **Cultural Values and Traditional Norms on Intermediate Variables and Their Effects on Fertility: India**
- 3.2 **Age-Specific Marital Fertility Rates from Ten Selected Studies Compared with European Pattern of Natural Fertility: Rural India, 1945-62**
- 3.3 **Mean Age at Marriage of Women: Selected European Countries, 18th-19th Centuries, and India, 20th Century**
- 3.4 **Fertility Estimates: Berar, 1881-1970**
- 3.5 **Fertility Estimates: India, 1881-1961**
- 3.6 **Observed Age-Specific Marital Fertility Schedules, Rural Areas of Selected States: India, 1959 and 1972**
- 3.7 **Estimates of Natural Fertility, Child Survival, Children Ever Born, and Proportion Ever Practicing Contraception for Currently Married Women, Married Only Once, Aged 35-44 with Two or More Living Children at Time of Survey: Ten Indian States, 1970**
- 3.8 **Mean Number of Children Ever Born and Level of Contraceptive Practice for Ever Married and Currently Married Woman: Bangalore City, 1951 and 1975**
- 3.9 **Age-Specific Marital Fertility Rates and Contraceptive Use: Bangalore City, 1951 and 1975**
- 3.10 **Mean Age of Brides of Census-Synthetic Cohorts, Selected States, 1901-81**
- 4.1 **Demographic Trends: India, 1901-91**
- 4.2 **Population Size and Growth Trends in India and the States**
- 4.3 **Trends in Dependency Ratios: India, 1881-1991**
- 4.4 **Age-Sex Distribution of Projected Population in Percentages: India, 1981-2021**
- 4.5 **Fertility and Mortality Trends: India, 1971-90**

List of Tables - Continued

- 4.6 **Urbanization Trends: India, 1901-2021**
- 4.7 **Increase/Decrease of Urban Population in Each Size Class: India, 1981-91**
- 4.8 **Trends in Distribution of Deaths by Causes: Rural India, 1961-89**
- 4.9 **Percentage Distribution of Deaths by Age and Sex: India, 1971-86**
- 4.10 **Reported Cases, Deaths, and Case Fatality Rates from Leading Communicable Diseases: India, 1971-86**
- 4.11 **Neonatal, Postneonatal, and Infant Mortality Rates: India, 1970-88**
- 4.12 **Antenatal and Maternal Factors Affecting Infant Mortality and Its Components, India, 1971-84**
- 4.13 **Socioeconomic, Environmental, and Other Factors Affecting Infant Mortality and Its Components, India, 1971-84**
- 4.14 **Time Lag of Other States from Kerala in Selected Demographic and Health Parameters: India, 1988**
- 4.15 **Macrolevel Economic Indicators: India and 11 Large Developing Countries, 1965-90**
- 4.16 **Comparison of Trends in Urbanization and Industrialization: 12 Large Developing Countries, 1965-90**
- 4.17 **Trends in Enrollment Rates in Primary, Secondary, and Higher Education and Literacy Levels: 12 Large Developing Countries, 1965-90**
- 5.1 **Family Planning Performance in Different Plan Periods: India, 1956-90**
- 5.2 **Annual Achievement of Targets of Family Planning Methods: India, 1966-90**
- 5.3 **Mean Age of Wife and Living Children at the Time of Acceptance of Three Family Planning Methods: Kerala, Uttar Pradesh, India, 1967-89**
- 5.4 **Percentages Protected and Effective Couple Protection Rates, All Family Planning Methods, as of March 31: India, 1970-90**
- 5.5 **Percentage Distribution of Couples Effectively Protected by Methods, as of March 31: India, 1980-90**
- 5.6 **Frequency Distribution of Districts by March 31 Contraceptive Protection Rate: India, 1990**

List of Tables - Continued

- 5.7 **Survey-Based Contraceptive Prevalence Rates Compared with Effective Couple Protection Rates Derived from Government Service Statistics: India, 1970-88**
- 5.8 **Current Use of Contraception According to ORG Survey and Government of India and Related CBR Values: India, 1980 and 1988**
- 5.9 **Contraceptive Prevalence Rate and Share of Sterilization Acceptors by Selected Characteristics of Couples: India, 1970-88**
- 5.10 **Basic Demographic and Family Planning Program Characteristics: Four States, India, 1984-91**
- 5.11 **Mean Value of Program Input and Performance, by Component, According to State and Level of Socioeconomic Development among PHCs, India, 1985-87**
- 5.12 **Effect of Different Program Input Factors at PHC Level on Sterilization Acceptance, Based on Multiple Classification Analysis: Four Indian States, 1985-87**
- 6.1 **Estimates of CBR and TBR before and after Independence: India, 1881-1989**
- 6.2 **Estimates of Total Natural Marital Fertility Using Two Methods: India and Major States, 1981-88**
- 6.3 **Fertility Measures: India and Major States, 1972 and 1989**
- 6.4 **Decomposition of Changes in CBR, Attributable to Different Factors Estimated by the Standardization Procedure, Using 1972 as Standard: India and Major States, between 1972 and 1989**
- 6.5 **Trends in Effective Couple Protection Rates and Fertility Rates: India, 1971-89**
- 6.6 **Percentage Changes in 1972-89 General Marital Fertility Rate Related to Percentage Changes in 1971-88 Effective Couple Protection Rate: Indian States**
- 6.7 **Socioeconomic and Demographic Conditions: India and States, circa 1989**
- 6.8 **Correlation Matrix of Selected Variables**
- 6.9 **Partial Correlation Coefficients of Total Fertility Rate (X_{10}) and Total Marriage Fertility Rate (X_{11}) with Effective Couple Protection Rate (X_7) and Contraceptive Prevalence Rate (X_8)**
- 6.10 **Mean Values of Last Closed Birth Intervals Compiled from Survey Data: Selected States in India, Fiji, and the United States, 1965-85**

List of Tables - Continued

- 6.11 Mean Values of Open Birth Interval, Selected States in India, Fiji, and the United States, 1965-85
- 6.12 Births per Married Woman over Five Years (t+1) to (t+5), with Birth or No Birth in Year "t": Nepal, Bangladesh, Sudan, and Goa, 1970-78
- 7.1 Population Growth Trends: Goa and India, 1901-91
- 7.2 Percentage Literate among Total and Female Population above Age 15: Goa, Kerala, India, Portugal, 1961-91
- 7.3 Singulate Mean Age at Marriage: Goa, Kerala, India, Portugal, 1961-81
- 7.4 Percentage of Women Aged 45-49 Remaining Single: Goa, Indian States, India, Portugal, 1961-81
- 7.5 Trends in Crude Birth and Death Rates: Goa, Daman, Diu, India, 1961-90
- 7.6 Crude Birth Rates over Three Decades: Goa, Kerala, and Portugal, 1961-89
- 7.7 Population Growth Trends: Kerala and India, 1901-91
- 7.8 Trends in Vital Rates and Age at Marriage: Kerala and India, 1931-89
- 7.9 Population and Fertility Trends: Tamil Nadu, 1921-91
- 7.10 Recent Trends in Selected Fertility and Mortality Indicators: Tamil Nadu, 1970-89
- 7.11 Comparative Demographic and Socioeconomic Profiles: Goa, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh, and India, 1981-90

List of Figures

- 2.1 Union of India Map**
- 3.1 Schematic Diagram of Factors Affecting Fertility**
- 4.1 Growth of Population 1901-1991**
- 5.1 Family Planning Performance: India, 1966-90**
- 5.2 Targets and Achievements in Family Planning: India, 1969-90**
- 5.3 Percentage of Acceptors (Wives) under Age 30: India, 1973-89**
- 5.4 Percentage of Acceptors (Wives) with Three or Fewer Living Children: India, 1977-89**
- 5.5 Percentage of Rural Acceptors of Sterilization and IUDs: India, 1979-90**
- 5.6 Percentage of Rural Sterilization Acceptors: India, 1989-90**
- 5.7 Percentage of Rural IUD Acceptors: India, 1989-90**
- 5.8 Contraceptive Prevalence Rate by Numbers of Surviving Children and Surviving Sons: India, 1988**
- 6.1 Infant Mortality Rate and Total Fertility Rate**
- 6.2 Female Literacy and Total Fertility Rate**
- 6.3 Contraceptive Prevalence Rate and Total Fertility Rate**
- 7.1 Political System in India**
- 7.2 Map of Goa State**
- 7.3 Map of Kerala State**
- 7.4 Map of Tamil Nadu State**
- 7.5 Differential Contributions of "Top Down" and "Bottom Up" Forces in Achieving Fertility Transition in Goa, Kerala, and Tamil Nadu**

Preface

India is an enigma to many people outside the country. Making general statements or expressing opinions on India is a risky endeavor since it is likely to attract immediate criticism and illustrations of differing points of view. This difficulty arises because of the enormous heterogeneity of the population in language, religion, ethnicity, cultural values, traditional norms, and socioeconomic conditions. These variables strongly influence fertility norms and behavior in a population.

India's large population base of over 866 million by mid-1992 (growing at 2 percent per year) creates images of severe Malthusian checks looming large in the near future. One-sixth of the world's population resides in India, and what happens to India's population and demography will strongly influence the global scene. The surprising, if not baffling, part of the Indian population scene is that India was the first country to recognize its population problem arising out of high fertility. It launched an official national program of family planning as early as 1952. There has been a strong will at the national level to control fertility and substantial expenditure has been incurred on family planning programs during the last 40 years. However, the fertility reduction at the national level has been slow and tardy. Countries such as China, Korea, Thailand, Sri Lanka, and Mexico that embarked on fertility regulation at a much later date have been more successful. India suffers by contrast. This book is an attempt to understand the nature of the efforts that have been put into the Indian family planning program, the results achieved at state and national levels, and the implications of successful experiences within the country that may help to make the program more effective.

The materials presented here were mostly prepared during the last few years of my service as Director at the International Institute for Population Sciences in Bombay. Because of heavy managerial responsibilities associated with the position, I did not find time to organize this material into a cogent volume. Such an opportunity was presented to me by The EVALUATION Project of the Carolina Population Center at the University of North Carolina at Chapel Hill, when I was invited to be a Senior Fellow to the project for one year. I am grateful to the United States Agency for International Development, Dr. Amy Ong Tsui, Director of the Project, and the Carolina Population Center for giving me this opportunity and providing me with the necessary facilities at the University.

I wish to place on record my sincere thanks to my colleagues and friends at Bombay Institute, particularly to Dr. K. B. Pathak, Acting Director, and P. Krishna Murthy, Technical Assistant, for helping me in the compilation and statistical analysis of various data sets. Marsha Bray Krzyzewski, Administrative Assistant to The EVALUATION PROJECT, offered support by arranging for needed personnel and skills and keeping things running

smoothly. The excellent secretarial assistance provided by Angela Bullock and Stephanie Dean in typing and preparing the manuscript deserves appreciation and acknowledgment. I gratefully acknowledge the professional editorial work of Lynn Moody Igoe, the graphics work of Amanda Quinby, and the assistance of reference librarian Laurie Leadbetter and library courier Serena McGuire, all of the Carolina Population Center. My wife, Bharathi, not only gave me constant support and motivation for completing the assignment but also took part in many hours of discussion and took dictation from me for later typing. I also thank the staff members of The EVALUATION Project who have assisted us in various ways to attain a comfortable pace of life in Chapel Hill.

The errors of omission and commission found in this volume are, however, wholly mine.

Chapel Hill
June 1993

K. Srinivasan

Chapter 1

POPULATION CONCERNS BEFORE INDEPENDENCE

Explicit concern over India's rapid rise of population originated in the third decade of this century. Until 1920, India's population had been growing very slowly owing to the heavy toll from famines, epidemics, and wars. According to census reports, the Indian population actually declined between 1911 and 1921 within its present geographical boundaries from 252.1 to 251.3 million because of the high mortality inflicted by the influenza pandemic of 1918-19. About 5 percent of the country's population--some 13 million persons--died in that epidemic (Davis, 1951). The population has increased steadily since 1921, largely because of epidemic and famine control and sanitation measures undertaken by the provincial governments. For the first time since the initiation of a systematic population census in 1881, India's population increased slightly more than 10 percent, or 27.7 million, in a decade, with the 1931 census enumerating a population of 279.0 million (Census of India Paper 1, 1951). Concern over this rapid rise in population arose from four quarters: intellectuals, social reformers (especially those interested in improving women's status), the Congress Party (the leading political party that spearheaded the movement for political independence), and the government.

During the first two decades of the century, a steady stream of Indian intellectuals and civil servants visited England for higher education or for training for posts in the Indian Civil Service. During their stay in England, they were exposed to Malthusian theories and the establishment of Neo-Malthusian Leagues in England and elsewhere in Europe, and became aware of the positive checks likely to operate on a population increasing beyond its means of subsistence. In the Western world, India was routinely cited as an example of a population likely to be subjected to such positive checks--wars, famines, and epidemics--because of the extreme poverty prevailing in the country and its prolific breeding.

England's famous 1878 Bradlaugh-Besant trial, during which the ethics of public advocacy and sale of artificial methods of birth control were debated extensively in court, made people aware of the various methods of birth control. The Indians who visited England became keenly committed to the idea of birth control as a means of regulating population growth and formed the Neo-Malthusian League in Madras in July, 1929. Some prominent public personalities, joined the League in Madras. They published a propaganda journal of high merit called The Madras Birth Control Bulletin (Himes, 1963, p. 123). They had periodic discussions on population problems and what measures could be taken to control

fertility, including the propagation of various artificial methods of family planning. Paying tribute to the work of this League, Census Commissioner, Hutton (1932, p. 1) said:

A definite movement towards artificial birth control appears to be taking place, perhaps less hampered by misplaced prudery than in some countries which claim to be more civilized; thus not only is artificial control publicly advocated by a number of medical writers, but Madras can boast of a Neo-Malthusian League, with two Maharajahs, three High Court judges and four or five men very prominent in public life as its sponsors.

The need for promoting modern methods of contraception among the married couples, the beginning of a rising trend in age at marriage and an optimistic note on the spread of contraceptive use in the population in the future in Madras province was perceived by Yeats, the census superintendent of Madras Province. In the 1931 census report for the province, he observed that

[until recently] artificial modes of keeping down the population have not been consciously adopted [on any considerable scale]...but there is a tendency for men certainly to marry later, and the beginnings of a like tendency in the other sex will probably appear ere long. The effects of this should be seen ultimately in a lower birthrate and a slower increase in population. Birth control, though advocated by among others a Judge of the High Court, and extensively advertised in the press, and not unknown in higher social circles, cannot be said to have as yet taken any marked place in the social system. *When it will, however, is merely deferred, and ten years should show a marked growth in its popularity.* Books on the subject are to be found in any bookstall or publisher's list and...it is unlikely that they can fail to exert some influence.

Contraception of a crude kind has been observed among Goudans of Salem apparently in order to prevent the undue growth of families, and consequent fragmentation of holdings and weakening of the joint family system and influence. The portent is of great interest. (Census of India, 1931, Madras Part I, xiv, 46)

Neo-Malthusian Leagues were started in other cities in India, especially Poona and Bombay. Madras and Bombay seem to be the first two Indian cities where concern over population problem gained momentum.

Real action on the birth control front seems to have started in Bombay, not as a means of regulating the population's fertility, but as a method of liberating women from the wheels of childbearing, preventing unwanted births, and reducing the hazards to the life and health of pregnant women who were willing to expose themselves to cruel and primitive methods of induced abortion to avoid having further children.

Professor R. D. Karve, a lecturer in mathematics in a Bombay college, undertook a lifelong mission to improve the status of women and advocated widow remarriage and the

practice of artificial methods of family planning. He lived the life of a saint and was totally devoted to his cause. In 1921 he published books in English on birth control and venereal diseases and in 1927 started a magazine, Samaj-Swasthya (Social Hygiene), in Marathi language, published regularly until his death in 1953. He started a contraceptive center in 1921 in Girgaum, in the heart of Bombay. Improvements in women's status in Maharashtra State are largely attributable to the pioneering efforts of Professor Karve.

Unfortunately the birth control program initiated in Bombay and Madras did not spread very rapidly because of Mahatma Gandhi's strong moral opposition to the use of artificial methods of birth control. Gandhi, the most influential leader of the Congress Party and the Indian freedom movement, while conceding that India's population growth had to be contained by reducing the number of children each couple had, stoutly denounced artificial methods of birth control. He argued that sexual abstinence is the only ethical means for birth control. He wrote periodically on birth control in his magazines Young India and Navajivan (New Life):

The society that has already become enervated through a variety of causes will become still further enervated by the adoption of artificial methods. Those men, therefore, who are lightheartedly advocating artificial methods cannot do better than study the subject afresh, state their injurious activity and popularize brahmacharya (celibacy) both for the married and the unmarried. That is the only noble and straight method of birth control (Young India, March 12, 1925).

Gandhi's views on sex and its use were clear and dogmatic: absolute continence for the unmarried; and for the married, intercourse only for procreation. Since he believed and taught that sexual intercourse for pleasure only was wrong, he was vehement in his condemnation of any artificial birth control. Contraception was considered immoral and damaging for individuals and for the nation. He wrote:

Sex urge is a fine and noble thing. There is nothing to be ashamed of in it, but it is meant only for the act of creation. Any other use of it is a sin against God and humanity. Contraceptives of a kind there were before and there will be hereafter, but the use of them was formerly regarded as sinful. It was reserved for our generation to glorify vice by calling it virtue (Navajivan, March 28, 1931).

The famous personalities in England and the United States, who were passionately advocating family planning and birth control as a means of liberating women from childbearing and improving their status as individuals in society, approached Gandhi for his support on birth control methods. Two eminent pioneers of the family planning movement,

Edith How-Martyn from England and Margaret Sanger from the United States, had discussions and correspondence with Gandhi on this matter. To Mrs. How-Martyn he wrote:

The creation of a new life is nearest the divine, I agree. All I want to say is that one should approach the act in a divine way. . . . Man unfortunately forgets he is nearest the divine, hankers after the brute instinct in himself and becomes less than the brute. . . . Man must choose either of the two courses, the upward or the downward; but as he has the brute in him, he will more easily choose the downward course than the upward, especially when the downward course is presented to him in a beautiful garb of virtue and that is what Marie Stopes and others are doing (Pyarelal, Mahatma Gandhi, 1956).

With Margaret Sanger, he was equally emphatic. When she cited hardship cases of women suffering because of frequent pregnancies imposed on them against their desire, he answered:

I agree that there are hard cases. Else, birth control enthusiasts would have no case. But I would say, "Go and devise remedies by all means, but the remedies should be other than the ones you advise." I carry on correspondence with many of these peoples and they describe their ailments to me. I simply say that if I were to present them with this method of birth control they would lead far worse lives (Pyarelal, Mahatma Gandhi, 1956).

In spite of the opposition Gandhi put forward for the use of birth control methods, the women's movement in India and the various voluntary organizations continued to propagandize and support the use of artificial methods of family planning. The All-India Women's Conference, constituted to improve the women's status in society, at their 1935 annual meeting in Trivandrum, focused on birth control and invited How-Martyn and Sanger. A number of opposing views were expressed, but after a considerable debate, the conference adopted a resolution approving birth control for health and welfare reasons. How-Martyn and Sanger took this opportunity to meet Gandhi and discuss with him the use of artificial methods of family planning. Despite their efforts to convert him to their side, Gandhi stood firm and rejected the use of artificial methods of family planning.

During the British rule, there was no official policy regarding population growth in India. Although some thoughtful British rulers clearly saw the necessity of introducing birth control in India, British rulers in general were not in favor of the birth control movement that had started making its presence felt in England in the mid-nineteenth century. They measured the success of their rule in India in terms of the magnitude of net addition to India's population. British rule in India could be justified only if the population of India were increasing substantially. A good illustration of the prevalence of this kind of thinking among British government authorities can be seen in the reply of the Governor of Bombay,

Sir Richard Temple, when presented with a request "to use his high character and transcendent ability to restrain, in some measures at all events, the inordinate aptitude of the people to increase population" (Hutton, 1932, p. 31). Sir Richard had replied indignantly that he would do everything in his power for the increase and nothing for the diminution of Her Majesty's subjects. The indifference of British rulers toward Indian population problems could be for two reasons:

1. British rulers had adopted a policy of noninterference in Indian social matters and, as far as possible, took no measures which could be considered as intrusion on Indian traditions, customs, values, and beliefs.
2. The issue of birth control was controversial in the British homeland.

However, even when the atmosphere against birth control started clearing in England and other Western countries, medical doctors in India still maintained a low profile about promoting it. In a textbook for British probationers of Indian Civil Service, Sir John Negaw, former Director of Indian Medical Service says,

such a problem as that of over population would have to be handled with discretion, but there can be no objection to the treatment of the subject on strictly biological lines. The advocacy of any special method of population control is quite unnecessary; all that is needed is a presentation of the underlying principles. These ticklish questions can best be dealt with by Indians who usually discuss them far more freely than is possible for Europeans, restrained as they are by the fear of giving offence. (Negaw, 1936, p. 22).

However, largely because of the intellectual foundations laid by Neo-Malthusian Leagues in various parts of the country and Karve's convincing argument for birth control, mainly that of protecting women's health and lives of women, the government of the princely state of Mysore, under the enlightened leadership of the Maharajah, officially sanctioned the opening of four family planning clinics in the state in 1930. Only two clinics were started immediately: one at Vanivilas Hospital in Bangalore, the second at Cheluvamba Hospital in Mysore. They were the first family planning clinics ever started under government auspices anywhere in the world.

Efforts of the pioneers, who wanted to propagandize family planning activities in India, came to a standstill in 1939 with the beginning of World War II. National priorities and the need to face imminent problems arising from the war created a lull in birth control activities during 1939-45, but with the end of the war, interest in family planning was rejuvenated.

With the death of Mahatma Gandhi in January 1948, moralistic opposition to artificial methods of family planning declined. In 1949 the Family Planning Association of India (originally called the Family Planning Committee) was formed, with pioneers like Professor Karve, Dr. A. P. Pillay, Lady Dhanavanthi Rama Rau, Mrs. Vembu, and Mrs. A. B.

Wadia, who were all active in family planning prior to the war and took an dynamic interest in the 1935 All-India Women's Conference.

Founding the Family Planning Association of India in Bombay in 1949 triggered a new epoch in the family planning movement, not only in India but also in many other countries. The International Planned Parenthood Federation, which coordinates voluntary activities in family planning worldwide, also began in Bombay in 1952. At the suggestion of Margaret Sanger, the International Committee on Family Planning organized the Third International Planned Parenthood Federation with the Family Planning Associations in India, the United Kingdom, the United States, Sweden, Holland, Hong Kong, Singapore, and West Germany as the founding members and with Margaret Sanger and Dhanvanthi Rama Rau as joint presidents. Launching this international movement in Bombay was a milestone in family planning activities, not only in India but for many other countries, because it gave a new impetus to voluntary family planning movements.

During the decade 1931-41, the Indian population soared from 279.0 million to 318.7 million: a 14 percent spurt in ten years, the highest ever achieved in India's history until that time. The majority of people continued to live under precariously poor conditions and standards of living continued to deteriorate. A severe drought in late 1942 created a serious food shortage in several parts of the country in 1943, culminating in a large-scale famine followed by epidemics in Bengal. Some 1.5 million people died in Bengal as a result of this famine in 1943 and 1944.

In July 1944, the Indian Government appointed the Bengal Famine Inquiry Commission under the Chairmanship of Sir John Woodhead, formerly Governor of Bengal, and including as one of its members R. A. Gopaldaswamy, an Indian Civil Servant who later became the first Census Commissioner and Registrar-General of independent India. The Famine Inquiry Commission Report submitted to the central government contained a section on potential dangers to the economy arising out of rapid population growth, especially in a population living in abject poverty and deprived of the bare necessities of life. The commission recommended very strongly that a population control program should become an integral part of any governmental development policy. It also emphasized the need to collect, compile, and analyze population-related data necessary for developmental assistance to different areas, especially compulsory registration of births and death. The 1945 recommendations of the Bengal Famine Inquiry Commission paved the way for the government of India to launch the official program of family planning as a part of its developmental strategy, on the attainment of independence in 1947.

The second major study that helped to encourage a population policy was the report of the Health Survey and Development Committee, also called the Bhore Committee, constituted by the government of India in 1943 (under the chairmanship of Sir Joseph Bhore).

This committee's 1946 report identified the India's major health problems and recommended various measures to undertake to improve public health, environmental sanitation, nutrition, and prevention of communicable diseases and suggested the organizational structure most appropriate for implementing these programs. This report devoted an entire chapter to population, strongly recommending the adoption of a national family planning program as an essential public health program. The specific recommendations contained in the reports of the Bengal Famine Inquiry Commission and the Bhole Committee essentially were instrumental in the family planning program becoming a constituent part of India's developmental strategy, starting with the first Five-Year Plan in 1951.

On the political side there appears to have been an ambivalence with regard to the position of the Congress Party on the use of artificial methods of family planning. While many Congress Party leaders strongly felt the need to curtail the rapidly rising population growth via artificial methods of family planning, many others held a strong moral view against these methods, following Mahatma Gandhi; this ambivalence persisted for a few years after his death. In 1938, the Indian National Congress under the chairmanship of Subhas Chandra Bose advocated a definite restriction in population growth. The National Planning Commission, appointed by the congress, under the chairmanship of would-be Prime Minister Jawaharlal Nehru, prepared a national development plan that included a section on population and recommended restriction of numbers in this guarded statement:

While measures for the improvement of the quality of the population and limiting excessive population pressure are necessary, the basic solution of the present disparity between population and standard of living lies in the economic progress of the country on a comprehensive and planned basis (Report of the All India Congress Committee, 1938).

Though there was no strong support coming forth for the advocates of artificial methods of family planning in India, the National Planning Commission recommended their use, including self-control, mainly in hopes of reducing the undesirable effects of injurious methods of birth control, such as induced abortion. The commission supported raising the age at marriage, discouraging polygamy, and introducing a birth control program including sterilization of persons with serious transmittable diseases such as epilepsy or insanity. Thus, while the attitude of the Congress Party was not so positive in its support for family planning, the attitudes of the government, voluntary organizations, and the intellectuals were becoming more and more favorable toward launching a national program of family planning. After the death of Mahatma Gandhi, the moralistic attitudes taken by the Congress Workers with regard to artificial methods of family planning weakened, though not wholly. Many of Gandhi's followers who originally advocated artificial methods, but who could not express their views opposite to Gandhi's strong sentiments, came forward to support a family

planning program and distribution of artificial methods of family planning. Thus in 1950-51, the time was ripe from all quarters--intellectuals, social workers, government, even political parties--to devise and launch a national program of family planning.

An undercurrent of denigration of artificial methods of family planning is still present among the Gandhians in India, especially those of the older generation who had the opportunity to meet and work with him. A view that using artificial family planning methods, especially on a regular basis, is immoral and unethical also pervades the psyche of a considerable section of the Indian society. The hesitancy seems to be more in the use of spacing methods that require repetitive action on the part of the couple than the adoption of a one-time permanent method such as sterilization.

Chapter 2

POPULATION POLICIES AND PROGRAMS SINCE INDEPENDENCE

PLANNING IN INDIA

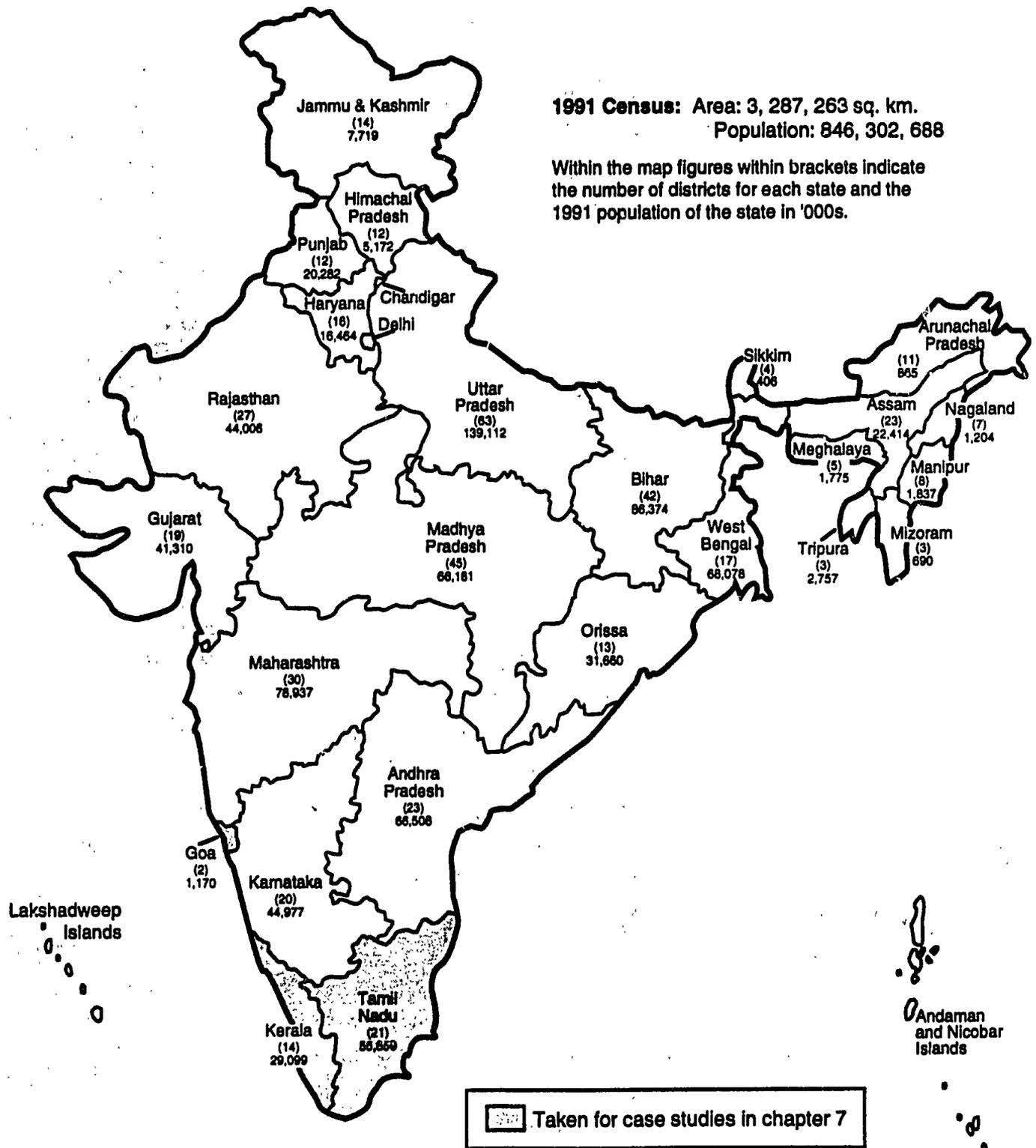
India attained political independence from the sovereignty of Great Britain on August 15, 1947, after more than one hundred years of political struggle. The political means adopted in the struggle for independence was essentially nonviolent, noncooperation with the rulers, organized under the leadership of Mahatma Gandhi since the last decade of the last century.

The achievement of independence in 1947 was accompanied by the painful partition of India into two nations, India and Pakistan. Pakistan, consisting of East and West Pakistan, two widely separated, geographically and linguistically distinct parts, was constituted as an Islamic state, while India remained a secular state. The few months before and after partition witnessed considerable streams of migrants across the borders, a good number of Muslims moving from India to Pakistan and Hindus and Sikhs from Pakistan to India. For various linguistic, cultural, and political factors, East Pakistan chose to become an independent nation and Bangladesh was born in 1972.

After independence, India chose to follow the political philosophy of democratic socialism as a federation of states and union territories (centrally administered regions). The constitution, adopted in 1950, delineates powers of the state and central government and guarantees certain basic fundamental rights to every citizen of the country. The states were formed on the basis of language spoken in the area; and on the recommendations of the States Reorganization Commission, a body set up under the Constitution of India in 1950, and implemented in 1956. As of March 1991 there were 25 states and 7 Union Territories (centrally administered regions) in the country. For administrative purposes, the states and Union Territories are further divided into districts. The district forms the basic administrative unit for the implementation of the policies and programs of the central and state governments and had an average population of 1.8 million in 1991, varying widely from state to state. Figure 2.1 gives a map of India, with the state boundaries, the number of districts in each state and the population of the state and the country as a whole according to the census of 1991.

After independence, India initiated a process of development to raise living standards and to open new opportunities for a richer, more varied life. The country is committed to some basic goals, namely, modernization, growth with social justice, and self-reliance; the path chosen to realize these objectives is one of democratic planning. The Planning Commission was set up in 1949 and the First Five-Year Plan covered 1951-56. Seven such Five-Year Plans have been completed, with a three-year gap--or plan holiday--between the

Figure 2.1
Union of India showing the states with
number of districts and population in 1991



third and the fourth plan and annual plans after the seventh plan. Since April 1992, the Eighth Five-Year Plan has been in effect.

A notable characteristic of India's democratic planning is the co-existence of the private and public sectors, which function as parts of a unified system. To attain the larger social goals, it was imperative that the public sector take the initiative in such vital areas as transport, communication, power generation, education, and social welfare.

The various social and economic institutions in India, such as the caste system and the Zamindari system (land ownership) are a legacy of the past, some in existence for over a thousand years. To achieve the goals of economic and social development for India, many of the elements of such institutions had to be transformed. These changes have been brought about not by force or compulsion but through democratic planning that emphasizes individual freedom and initiative and allows no coercion of any type.

The constraints imposed by this political philosophy, chosen by India for its development, and the complexities arising out of the heterogeneity and diversity of the population, pose a big challenge to the process of development in India, especially in the field of social change. For example, while a country like China with one-party communist rule can impose on its people a stringent family size norm of one child per couple, and achieve considerable success without much popular revolt, India has not realized even the moderate fertility goals postulated in any of its seven Five-Year Plans. The limitations imposed by the political philosophy, within which various economic and social developmental programs operate, must be kept in mind when evaluating programs such as family planning or public health in India and comparing their achievements with those of other countries. A brief review of population policies and programs in India as they evolved through various Five-Year Plans follows.

OFFICIAL POPULATION POLICIES AND PROGRAMS

In April 1950, the government of India appointed a Population Policy Committee under the chairmanship of the Minister of Planning, and upon the Committee's recommendation, a Family Planning Cell was created in the office of The Directorate-General of Health Services. The First Five-Year Plan document, presented to parliament in December 1952, referred to a program for "family limitation and population control." It sought to reduce the birth rate "to the extent necessary to stabilize the population at a level consistent with the requirements of the national economy." This was the genesis of the first official national family planning program in the world and a brief review of the population policy component in the first and successive Five-Year Plans follows.

The First Five-Year Plan 1951-56

The First Five-Year Plan formulated that the program for family limitation and population control should:

- present a clear picture of the factors contributing to the rapid population increase in India
- discover suitable techniques of family planning and devise methods by which knowledge of these techniques could be widely disseminated
- give advice on family planning as an integral part of the service of government hospitals and public agencies.

A sum of 6.5 million rupees (or \$US 1.44 million at the exchange rate of \$1 US=Rs. 4.5) was allocated by the central government to the Ministry of Health for a family planning program which included a plethora of activities such as providing contraceptive advice; experimenting in the field with different family planning methods to determine their suitability, acceptability, and effectiveness in different sectors of the population; developing suitable ways to educate the people on family planning methods; collecting information on reproductive patterns, attitudes, and motivations affecting family size; studying the interrelationships among economic, social, and population changes; and researching the physiological and medical aspects of human fertility control. The belief that there was already some intrinsic demand for family planning services, and that supply would induce demand, prompted the government to open family planning clinics as service centers during this period. The people were expected to go on their own to these clinics to demand and receive family planning services. The methods recommended were diaphragm and jelly, vaginal foam tablets, and condoms. Sterilization services, especially vasectomies, were provided in some states. No numerical goals were set for the crude birth rate or for the population growth rate. A Central Family Planning Board was constituted as an apex advisory body at the national level.

The Second Five-Year Plan 1956-61

The family planning program made notable progress in the period covered by the Second Five-Year Plan, continuing the same strategy as in the First Five-Year Plan, namely the expansion of family planning service facilities through clinics. A more vigorous action-cum-research program was undertaken. The distribution of contraceptives was extended through primary health centers, government hospitals and dispensaries, and maternity homes run by state governments. In rural and urban areas, contraceptives were issued free to those with monthly incomes below 100 rupees, and at half price to those in the 100-200 rupee income group. The Central Family Planning Board recommended the inclusion of sterilization in the family planning program in hospitals and institutions where

facilities existed. The first Registrar General of India, R. A. Gopaldaswamy, who served as Secretary of the Bengal Famine Committee, was highly motivated to curtail population growth. He also became Chief Secretary of Madras State in 1954. He was largely instrumental in introducing vasectomy as the major family planning method in Madras and promoting it with a scheme of incentives. Emphasis on sterilization can be attributed to the deep concern of the socioeconomic consequences of rapid population growth and the need to diminish growth as quickly and effectively as possible.

In the states of Madras and Bombay (now Tamil Nadu and Maharashtra), the sterilization program was introduced for men with much enthusiasm. An incentive scheme paying 10 rupees to a sterilization acceptor as compensation for the loss of wages sustained in undergoing the operation was first introduced in Madras, followed by Maharashtra and other states. The Central Council of Health also recommended that state governments should intensify the sterilization program and provide surgical facilities at their hospitals and medical institutions. The number of clinics for provision of family planning services increased from 147 at the end of the First Five-Year Plan to 4,165 at the end of the Second Plan, with the expectation that people would go there for advice and services. Research activities were extended to the fields of demography and communication action. In the first two plan periods, the approach was essentially clinic based, in the expectation that clinic use by married couples would rapidly increase and that the motivation for reduction of family size and spacing births had already built up among the people because of high levels of poverty and population density. Providing services with some incentives to acceptors was considered adequate for curtailing growth rate. With hindsight, this seems to have been a simplistic assumption.

Considerable progress was achieved at the contraceptive testing units in Bombay and elsewhere under the guidance of the Indian Council of Medical Research and the All India Institute of Hygiene and Public Health in Calcutta. Demographic research centers were set up in Bombay, Calcutta, Delhi, and Trivandrum.

Established in 1956, the United Nations Regional Demographic Training and Research Center at Bombay (now the International Institute for Population Sciences) became a reputed center for training students from Asia and the Pacific region in demography and population studies. Several valuable field investigations were carried out, such as the India-Harvard Population Study in Punjab, the Mysore Population Study, the Lodhi Colony Study in Delhi, the Singur Study in Calcutta, and the Pilot Health Project in Gandhigram. A broad-based training program was developed that included centers for training instructors and educators in family planning, rural training-demonstration and experimental centers, training clinics in the regional training centers, and ad hoc training courses for workers and supervisors. Family planning was incorporated in the normal training program of a number of educational

institutions for doctors and medical auxiliaries. The provision for family planning during the Second Five-Year Plan increased from Rs. 6.5 million to 50 million (although the money actually spent during the First and Second Five-Year Plan periods was only Rs. 1.5 and 21.6 million respectively). The action-research experiments in Gandhigram and elsewhere indicated that the clinic approach to family planning might not be effective in reaching all couples and that an extension approach, wherein interested and influential leaders were involved in the program, would stimulate the demand and supply for the program more effectively (Ranganathan, Srinivasan, and Mathews, 1964).

The Third Five-Year Plan 1961-66

During this plan period, the program received further expansion with an expenditure of Rs. 248.6 million. The clinic-oriented approach adopted during the first two plans was replaced by an extension-education approach aimed at bringing the message and services to people in the far corners of the country through the network of rural primary health centers and subcenters and urban hospitals and family welfare training centers. Based on field experiments conducted at Gandhigram Tamil Nadu, the change in strategy involved using interested and influential village leaders in promoting the small family norm and carrying the message of family planning to couples. The objectives of this extension approach, which continues to be a pervasive methodology in the Indian family planning program to date, are

- creation of a group norm of a small family size in every community by educating and involving opinion-leaders
- providing information to every eligible couple on available contraceptive methods
- furnishing contraceptive services in a socially and psychologically acceptable manner.

The family planning program was made an integral part of public health departments in the states. Unlike the clinic approach, wherein family planning personnel wait for eligible couples to come to their clinics seeking advice and supplies, the extension approach relied on peripheral health workers, particularly auxiliary nurse-midwives and family planning health assistants (FPHAs), for the crucial task of identifying, informing, and motivating eligible couples. These peripheral health workers were the least paid, least qualified, and probably least motivated themselves to undertake the stupendous task of motivation for the small family norm, but the strategy helped to spread the message of family planning to every village in the country.

The "cafeteria approach" to methods of family planning was officially adopted, leaving the choice to the acceptor, but there was an official emphasis on sterilization. Responsibility for distributing simple contraceptives and giving general advice on family planning was laid

to a much larger extent on voluntary organizations, paramedical personnel, and extension-educators trained in family planning. Detailed plans concerning the production of contraceptives by the government and private firms were drawn up. The assistance of voluntary organizations, labor unions, and other organizations was sought on as large a scale as possible. The system of giving compensation money to acceptors of sterilization and incentives to the motivator who influenced a couple to accept the terminal method of family planning was introduced in most states during this plan period.

The symbol of an inverted red triangle representing the message of family planning was introduced; it continues to be the family planning logo in the country.

The third plan is unique because for the first time, a demographic goal was set: a crude birth rate of 25 by 1972, a goal judged from hindsight as overly ambitious. The family planning program was viewed not simply as a social welfare measure for improving women's health and status, or in helping couples to space and limit their children according to their desires, but as a positive policy instrument for achieving the country's demographic goal. A strong stimulus for the setting up of demographic goals for India, in terms of desired levels of crude birth rates, came from the publications of Coale and Hoover (1961). They studied the economic implications of high fertility and population growth to less developed countries and demonstrated through sound economic arguments and empirical data analysis how rapid reductions of fertility in developing countries would contribute to higher rates of savings, investment, capital formation and acceleration in per capita income. They took for their illustrations the economies of India and Mexico and argued that national expenditures that would otherwise go for consumption purposes could be diverted to investment purposes when fertility levels decline earlier and more rapidly. During this plan period, the program expenditure increased to Rs. 248.6 million, 11 times that in the second plan.

The period 1966-69 was termed a plan holiday, when there was no Five-Year Plan as such; but the earlier programs continued with annual budgeting and target setting. The disruption in the sequence of five-year plans was mainly because of certain political crises that arose because of conflicts India had with her neighbor China.

During this interplan period, family planning was fully integrated with the Indian public health program, especially the maternal and child health program (MCH) operated through rural primary health centers (PHC) and urban family welfare training centers. The main program characteristics were:

1. The pattern of personnel to be deployed in the program was decided at the national level, purely on the basis of the population size of each PHC, district, or state, with no concern for differential states of readiness of the people in diverse groups such as urban-rural residence, literacy, existing health conditions, infrastructural health facilities available, etc.

At the peripheral level, such a standardization involved providing one trained female auxiliary-nurse-midwife (ANM) for every 10,000 people to attend to maternal and child

health and family planning service, and one male worker (family planning health assistant, FPFA) for every 20,000 people to provide family planning motivation and service for men, and also to have charge of selected public health programs in the community. The posts of one lady medical officer (LMO) and one block extension educator (BEE) for each primary health center (PHC), covering approximately 100,000 people, were also created to organize education and motivation work, provide guidance and supervision to the fieldworkers, and deliver clinical services.

2. On paper the organizational pattern was the same for the whole country, but in reality, the number of employed personnel varied widely from state to state depending on availability of adequately skilled personnel, training facilities, organizational capabilities, and general socioeconomic conditions of the area.

3. The program advocated a cafeteria approach, but in practice, emphasis was mainly on sterilization, particularly vasectomy. The intrauterine device (IUD) was introduced into the program in 1965, but without adequate informational and educational programs or suitable facilities for training personnel involved in the program, proper case selection and techniques of insertion, and without follow-up care.

Because of the lack of good service and inadequate follow-up care, the IUD fell into disrepute. In addition, a good number of medical specialists campaigned against the IUD, so it was practically withdrawn from the program after two years of unsuccessful attempts to encourage it as a routine family planning device in India. Viewed in retrospect, this was a unfortunate strategic mistake since a family planning method that could have been extremely useful for spacing purposes and accepted by younger couples was brought into disrepute. The program had to rely heavily on sterilization, particularly vasectomy, and slightly higher incentives were given to all concerned with sterilization: acceptor, doctor, and motivator. In 1966, the target for the crude birth rate (CBR) was refixed at 25, to be realized by 1975-76, but it was again revised in 1968 stipulating a CBR of 23 by 1978-79. The expenditure during the three-year plan holiday on family planning was Rs. 704.6 million, almost three times that during the five years of the third plan.

The Fourth Five-Year Plan 1969-74

In the Fourth Five-Year Plan, family planning was included among programs of the highest priority. A numerical target was set for reducing the crude birth rate from 39, estimated at the beginning of the plan, to 32 in five years and to 25 per thousand by 1979. To achieve this goal, a concrete program was devised for expanding family planning service facilities and motivational educational aspects through the mass media. Rs. 3,150 million were budgeted for the program; actual expenditure was Rs. 2,844.3 million. The infrastructure was considerably expanded during this period. The number of conventional contraceptive users doubled from 1.5 million in 1969-70 to 3 million by 1974-75, and the number of sterilization acceptors rose from 1.4 (of which 75 percent were vasectomies) to 3.1 million in 1972-73 but plummeted to 0.9 million in 1973-74 with a small rise to 1.4 million in 1974-75. As a result of the program, an estimated 28 million couples were protected by 1973-74, and an estimated 12 million births were averted during the plan period.

During this plan period, the program to popularize oral contraceptives expanded considerably. Due to lack of preparatory educational, motivational, and training programs, the pill did not gain the popular acceptance it deserved. A system for free condom distribution (the depot holders system) was introduced. Surgical equipment was provided in rural and urban family welfare centers for vasectomies--once again the major plank in the strategy to meet the time-bound targets mentioned in the fourth plan documents. Plans were made about how to popularize sterilization and achieve the targets. Increased emphasis went to the camp approach, whereby sterilizations were carried out in villages, at suitable locations for conducting surgery, and rural facilities were strengthened to meet the additional needs of this camp approach. The incentive payment was also raised. The famous Ernakulam Camp in Kerala state in which over 65,000 vasectomies were done in two weeks was organized during this plan and became a model for other such camps.

Towards the end of this plan period, the mass-camp approach was replaced by the mini-camp approach; whereby in any one camp not more than 25 men could be sterilized. This changeover was necessary since numerous postoperative complaints from men operated on in large camps. The program suffered a setback in 1973-74 when the number of sterilizations declined by 2.2 million from the previous year.

Increased emphasis went to postpartum programs in major hospitals, urban family welfare training centers, and selected PHCs. In 1971, the Indian parliament passed a law liberalizing induced abortions under the Medical Termination of Pregnancies Act, which became effective in April 1972, making it possible for pregnant women to have legal abortions almost on demand.

During the fourth plan period, the sterilization target was 14.9 million, of which about 61 percent was achieved. Program expenditure during this plan was Rs. 2,844 million--annually almost 2.5 times the disbursement during the interplan period 1966-69. However, 1971 census data revealed that the high rate of population growth had continued unabated during the decade, from 439.2 million in 1961 to 548.2 million in 1971--a 24.8 percent increase compared to 21.5 percent in 1951-61. This increase was very frustrating to policy makers and program administrators in family planning who expected a more rapid decline in fertility because of their efforts.

The Fifth Five-Year Plan 1974-79

The Fifth Five-Year Plan, implemented in its original form only for four years (and undergoing drastic modification because of two changes of central government in this period), witnessed a dramatic rise and fall in family planning acceptance. Findings from the 1971 census, and the nonrealization of goals for the crude birth rate and acceptor-targets set in earlier plans, highlighted the limited success of India's family planning program, and

emphasized the need to intensify the program considerably if it were to bear any fruit. The fifth plan document re-fixed the demographic goal of a birth rate of 30 by 1979 and 25 by 1984. During 1974-78, Rs. 4,089.8 million were spent on the program and it received a high priority from the government. Continued high fertility was perceived as the greatest impediment to socioeconomic development. In 1976, a comprehensive National Population Policy was formulated for the first time in India's history and approved by the parliament (see Appendix A).

This policy aimed at making a "frontal attack on the problems of population." The incentive payment to acceptors was substantially increased and related on a sliding scale to the number of living children a couple had at the time they accepted sterilization.

There were innovative political and fiscal incentives to the state governments to implement the family planning program very seriously. Representation to parliament from each state would be frozen at the 1971 census levels, up to the year 2001, making it politically unattractive for any state to increase its relative population size in the hope of securing political strength at the center. There was a scheme for community incentives to villages and towns achieving high levels of contraceptive protection.

More than any other measure, concerted efforts to improve the program's organizational efficiency by insisting on performance targets from the vast army of family planning personnel and the coordinated efforts of all government departments in the program seemed to have achieved good results. The imposition of a national emergency in 1976 gave a different dimension to the program. The entire administrative machinery was geared to boost family planning acceptance, particularly vasectomy, with an impression that once population growth was arrested, various developmental efforts would have a much greater impact on the quality of life for the Indian people. Laws making it compulsory for couples to stop reproduction after two or three children were beginning to be drafted and placed before state legislatures for approval. The underlying motivation behind the 1976 National Population Policy (Appendix A) was attaining more rapid social and economic development than previously achieved.

Family planning program performance during 1976-77 was the best ever realized in the history of any country, with a total of 8.26 million sterilizations--more than the total number done in the previous four-years. Had this tempo continued, even on a slightly more modest scale, for a few more years, India's birth rate would definitely have plunged as dramatically as it had in China.

India's large-scale political unrest demanded that general elections be conducted as early as possible. The February 1977 elections brought defeat to the party in power at the center and in most of the states. One of the key election issues was government imposition of a coercive family planning program. With the change of political parties at the center, the

program became a victim of political controversies and almost completely collapsed during 1977-78. As a political reaction to the policy of June 1976 (Appendix B), in April 1977, the Minister of Health and Family Planning announced a new statement of policy on the Family Welfare Program. The term family planning was changed to family welfare. The new government reiterated its total commitment to the Family Welfare Program, to bring the birth rate down to 25 per thousand by 1984 as stipulated in the 1976 policy.

The policy statements of 1976 and 1977 shared a number of common elements, although they came from different party lines. Both emphasized raising the age at marriage; expanding women's education; introducing population education programs in schools; involving all government departments in the program, plus voluntary youth and women's organizations; linking the percentage of central assistance to the states with their performance in family planning; conducting research in reproductive biology; making use of all media; and seeking the people's participation in the program.

The 1977 policy has some notable departures on the government's approach in achieving the targets. While the earlier policy considered it impractical to wait for education and economic development to bring about lower fertility and sought a direct assault on population problems, the 1977 policy chose to achieve the same goal through a program of education and motivation. The 1976 policy allowed state governments, if they felt it necessary, to enact legislation for compulsory sterilization; the 1977 policy was totally against compulsory sterilization legislation of any kind. It states: "Compulsion in the area of family welfare must be ruled out for all times to come. Our approach is educational and wholly voluntary (Appendix B, para 3)."

Further, while the 1976 policy depended mainly on sterilization for achieving the target, the new policy emphasized all methods of family planning with the belief that

...by-and-large the people of India are conscious of the importance of responsible parenthood; given the necessary information and adequate services they will accept a small family norm. We will promote all methods with equal emphasis and it will be left to every family to decide what method of contraception it will like to adopt (Appendix B, para 4).

The minimum age at marriage of 18 for girls and 21 for boys, recommended in the 1976 population policy, was enacted into law by the new government in October 1978.

Because of lack of political will and support for the program, lack of organizational efficiency, and rapid decline of morale and interest among family planning workers, the program slumped and fewer than one million sterilizations (one-eighth of the previous year) were done in 1977-78 although the same expenditure was incurred that year. During the provisional sixth plan period 1978-79 and 1979-80, program expenditure was Rs. 2,260.5 million, almost equal the amount spent in the previous two years, mostly on salaries. But

the average annual performance in the three years 1977-80 was dismal despite huge expenditures. The change of government in January 1980 marked another turning point in the program and helped to restore it, with emphasis continuing on its voluntary nature.

The significant experiences with the family planning program during 1976-78 revealed that compulsion in family planning must be ruled out in the democratic Indian setting. Unlike communist China, which could enforce a one-child family policy and motivate people to accept it without expressing options or alternatives in desired family size, in India implementation of a compulsory two or three-child norm had been very difficult, if not impossible. The defeat of the government in 1977 was partly attributable to the form of persuasion introduced in family planning in some states during 1976. The 1977 policy was welcomed as a type of liberation for the expression of individual attitudes and opinions on family size and freedom of choice for a couple on contraceptive methods.

From a retrospective analysis of developments during this period, it seems India made a sacrifice in terms of delayed demographic transition, and possibly socioeconomic development, to safeguard her people's democratic rights. It is doubtful whether a compulsory family planning program could ever be implemented in India within the present political structure or that centrally specified demographic goals could be imposed on the states.

The Sixth Five-Year Plan, 1980-85

A Working Group on Population Policy was set up by the Planning Commission in 1979 to formulate long-term policy goals and program targets for the family welfare program. This group (of which the author was a member) recommended the adoption of a long-term demographic goal of reaching the net reproduction rate (NRR) of one by the year 1996 for the country as a whole, and by 2001 in all states. The change in focus from the crude birth rate to the NRR as the demographic goal arose out of a realization, from historical and more recent demographic experiences within India and outside, that low birth rates have never been achieved without substantial reductions in death rates, especially in infant mortality. To quote from the report of the Working Group:

As already stated, the fertility rates of a population are an integral part of the levels of development of the society and low fertility rates can be sustained only in the context of a certain level of development. There is practically no historical evidence of crude birth rates of below 20 per thousand sustained in a population which is economically and socially backward.

The Working Group feels that a stage has come in the demographic transition of India where its future fertility goals should be linked with some developmental variables, if these goals are to be realized and sustained.

One of the universally agreed goals of development is the reduction in the levels of mortality of the population, particularly infant mortality, leading to a higher expectation

of life. Increased span of life is a universally accepted index of development. Fertility goals can be linked to mortality levels through the index of net reproduction rate (NRR). The expert Committee on Population Projections have assumed a steady increase in the expectation of life of the population of India, from its present levels to about 64 years for both males and females by the year 2001. It appears that the nation should have a long-term demographic goal, specified in terms of net reproduction rate of unity. This is a level which has to be reached if the population has eventually to attain a stationary condition.

We feel that this NRR should be achieved in the minimum amount of time, not later than the turn of the century. The NRR of unity, or one, implies that for a given set of conditions of mortality and fertility, on an average a woman will be replaced by just one daughter, and the two-child family will be the normal pattern in the society by the year 2001. (India, Planning Commission, 1980, pp. 16-17).

Under these conditions, it was calculated that by the turn of the century India's crude birth rate would be 21, the crude death rate 9, the infant mortality rate 60, life expectancy at birth 64 years, and 60 percent of couples in the reproductive ages would be effectively protected by contraception. Fixing long-term goals in terms of NRR of one has a number of advantages:

1. An NRR of one has the inherent substantive validity of linking fertility decline to mortality decline--a necessity to reach stable low levels of fertility.
2. While systematic changes in NRR cause smooth changes in the age distribution of a population, constant reduction in the crude birth rate may cause uneven changes or jerks in its age structure.
3. Achieving a net reproduction rate of one and maintaining the same level would ultimately lead to zero population growth (ZPG) which may be the ultimate long-term demographic goal of every country.
4. Goals of a net reproduction rate of unity require that organized programs for mortality reduction are undertaken as necessary adjuncts of fertility reduction programs.
5. An additional advantage of fixing a long-term demographic goal of an NRR of one is that this macrolevel concept is equivalent to the microlevel family size norm, the expected family size, or average number of living daughters a couple has when they cross the reproductive period; an NRR of one essentially advocates a two-child family norm.

The time by which an NRR of one is to be achieved can be adjusted according to the plans and resources of a country, but it seems to be a significant intermediate goal to realize before achieving the ultimate goal of zero population growth. Methods of estimating family planning targets to achieve a given trend of NRR values are illustrated for different states of India in the work of Srinivasan, Roy, and Ghogale (1980).

The experience with target setting in terms of crude birth rates to be achieved over five or ten years, as formulated in the earlier Five-Year Plans, indicates that targets were never achieved and goals had to be revised time and again on the basis of actual performance (see Table 2.1). Until 1980, fertility goals were not linked to mortality goals and often efforts in fulfilling family planning targets were at the cost of fulfilling the targets of the maternal and child health program or other public health programs, since the same personnel were involved at the peripheral level. From the view of linking fertility and mortality goals and achieving a smooth transition in the age structure, as an intermediate step to reaching zero population growth and for ease in popularizing a given family size, it seems advantageous to focus long-term fertility goals on a net reproduction rate of unity and planning programs of fertility and mortality reduction simultaneously.

In countries like India, where mortality is still relatively high (though declining), involving health personnel in the family planning program and evaluating their performance mainly on family planning acceptance targets is bound to slow progress on the public health front and eventually in the family planning program as a feedback. Emphasizing the family planning program solely as a means of fertility reduction has some justification only in areas or countries where the life expectancy is high (probably over 60 years) and infant mortality is relatively low. For example, adopting a one-child family norm in China is partly validated on the grounds that China had by 1978 already realized substantial reductions in mortality, particularly infant mortality, so a couple can be assured a high chance of the child's surviving to adulthood. Ensuring child survival seems to be a very important reason for a couple to adopt a limited family size norm of two or three children. Linking mortality to fertility goals, and specifying targets in terms of the net reproduction rate, is a fundamental conceptual departure in the setting of demographic goals adopted in the Sixth Five-year Plan.

A policy perspective emerges from an analysis of a changing age pattern of marital fertility recently observed in India as in many other developing countries. It has been observed that fertility declines from the 1970s (discussed in detail in subsequent chapters) are mainly because of declines in the marital fertility of women aged 30 and above. This decline suggests that in the earlier stages of program development, family planning methods have been used predominantly to limit family size rather than to space children.

Table 2.1 Desired Demographic Goals: India, 1962-97

Year of Statement	Specified Goal	Target Year for Achieving Goal
1962	CBR, 25	1972
1966	CBR, 25	as promptly as possible
1968	CBR, 23	1978-79
1969 (start of 4th plan)	CBR, 32 CBR, 25	1974-75 1979-81
1974 (start of 5th plan)	CBR, 30 CBR, 25	1979 1984
April 1976 (I Population Policy)	CBR, 30 CBR, 25	1978-79 1983-84
April 1977 (II Population Policy)	CBR, 30 CBR, 25	1978-79 1983-84
January 1978 (Central Council of Health)	CBR, 30	1982-83
January 1981 6th Five-Year Plan (1980-85)	NRR, 1; CBR, 21; CDR, 9; LEB, 64 years; CEP, 60%	2000
7th Five-Year Plan (1985-90)	NRR, 1 CBR, 29.1; CDR, 10.4; IMR, 90; CEP, 42% universal immunization antenatal care-75%	by 2006-11 by 1990 by 1991 by 1990
8th Five-Year Plan (1992-97)	LEB--Male LEB--Female IMR CDR CBR GFR	1991-92 1996-97 2006-07 57.7 60.1 66.1 58.7 61.1 67.1 78.0 68.0 48.0 10.0 8.7 7.4 28.9 25.7 21.7 130.3 113.0 91.4

Notes: CBR = crude birth rate; CDR = crude death rate; CEP = percentage of eligible couples effectively protected; GFR = general fertility rate; IMR = infant mortality rate; LEB = life expectancy at birth; NRR = net reproduction rate

Source: Updated from Srinivasan, 1987, Table 1

The data also reveal that marital fertility rates of women under age 30 had actually increased in the last two decades in a number of Indian states, indicating an increase in the natural fertility of younger couples and absence of any increase in spacing children. The tendency among Indian couples thus far seems to be to have the desired number of children as they arrive, following customs and traditions as far as possible, then to stop childbearing permanently via sterilization.

For many years public health specialists, family planning and medical personnel have advocated child spacing to promote the health of mothers and children, but the idea does not appear to have taken root, nor is it likely to in the near future without appropriate planning and program strategy. Even spacing methods such as the pill and IUD seem to be used by married women essentially for limitation purposes. While cultural values and traditional norms seem to accommodate use of modern methods, especially sterilization, to limit family size, they do not seem to encourage or universally accommodate, the use of spacing methods.

Surprisingly, the recent trends in family planning acceptance even in Western countries reveal that the proportion of eligible couples adopting permanent methods such as vasectomy or tubectomy has increased substantially in the past decade. These findings suggest that the emphasis placed thus far in India on sterilization has been consistent with global trends, and that the country should substantially increase and improve sterilization facilities. The strategic deficiency seems to be the lack of intensive and well-orchestrated information-education-communication programs on spacing methods and extending the availability of spacing methods with backstopping facilities for induced abortion. Induced abortion seems to be gaining popularity among those who have used a nonpermanent method and failed. Also noteworthy is a global trend towards female methods of contraception and that women may dictate future family size and fertility levels.

Taking the factors above into consideration, the sixth plan document envisaged the following long-term and short-term goals.

Long-term goals. (1) Average family size would be reduced from 4.2 children in 1979 to 2.3 by 2001; (2) the birth rate per thousand would be reduced from 33 in 1978 to 21 by 2001; (3) the death rate per thousand would be reduced from about 14 in 1978 to 9, and the infant mortality rate would be reduced from 129 to 60 or less by 2001; (4) instead of about 22 percent of eligible couples protected by modern family planning methods in 1978, 60 percent would be protected by 2000.

Short-term goals. If the long-term goals above are to be achieved, during the Sixth Five-Year Plan (1980-85), the estimated number of sterilizations should be 22 million, the number of IUDs to be inserted should be 22 million, and the number of conventional

contraceptive users (condoms, oral contraceptives, other conventional methods) should increase annually to reach an estimated 11 million in the period of 1984-85.

Achieving these targets was expected to ensure an increase in the effective couple protection rate to 36.6 percent by 1985. In addition to these targets specifically for the family planning program, there were specific targets for general and maternal and child health services to ensure the reduction of general health and infant mortality towards the desired long-term goals.

The program strategy adopted to reach the goals included the involvement of a large number of community health workers (CHWs; later redesignated village health guides [VHG]) to promote people's participation. For each village or group of hamlets (covering a total population of 1,000), one community health worker was selected on the basis of his qualifications, interest in health and family planning activities in the village, and leadership qualities. The CHWs received three months of training, a kit of simple medicines and contraceptive devices (condoms and pills), and were supervised and guided by program personnel.

CHWs were paid a nominal monthly honorarium and were considered to be community leaders providing liaison between the official health workers and the community. This system, implemented in most Indian states, revealed that the active involvement of community leaders promoted people's health and family planning practice. Unfortunately, not all CHWs were interested in health and family planning nor were many of them influential in their communities.

Evaluation of the Sixth Five-year Plan, in terms of actual performance versus the targets, revealed that against a target of 24 million sterilizations, slightly over 17 million had been carried out; against a target of 7.9 million IUD insertions, about 7 million were done; and against a target of 11 million conventional contraceptive (CC) users during 1984-85, about 9.3 million were enrolled in the program during the year. Program achievement in relation to targets was quite high during this Five-year Plan.

The seventh plan document (1985), reviewing critically the performance of the program during the sixth plan, came to the following conclusions:

1. Achievements fall short of the target, particularly in sterilization. IUD insertions and CC users reached a high level, around 80 percent and above.
2. The effective couple protection rate achieved by March 1985 was about 32 percent, an increase of ten percentage points in five years, though still below the sixth plan target of 36.6 percent.
3. While in the first two years of the sixth plan, couple protection grew only by about 0.5 percent and 1 percent respectively, in the last three years, couple protection accelerated to about 2.5 percent each year.

Thus there seems to have been a resurgence of the tempo of the program since 1980. The performance analysis by states reveals that national averages are substantially lower because of the relatively poor performance in Uttar Pradesh, Bihar, and Rajasthan. These three northern states, which account for 31 percent of the Indian population, had 1985 couple protection rates under 20 percent--Uttar Pradesh 16.7 percent; Bihar 16.8 percent; and Rajasthan 19.3 percent--against the national average of 32 percent. Madhya Pradesh and West Bengal (the two other large northern states, together accounting for 16 percent of India's population) had couple protection rates of 29 percent. Special efforts for raising the couple protection rate appeared necessary in these five states.

During the sixth plan, an allocation of Rs. 10,780 million was made in the sector of family welfare; the actual expenditure is estimated at Rs. 14,480 million (or US \$1200 million at the exchange rate of \$1 US=Rs. 12 in 1985). The sixth plan increased the per capita expenditure on the family planning to its highest since the implementation of the program as an official development policy.

The Seventh Five-Year Plan 1986-91

The Seventh Five-Year Plan document, covering 1985 to 1990, endorsed the long-term demographic policy of reaching a net reproduction rate of one by the year 2000, but in the context of the actual performance during the sixth plan, the cautious expectation was that this goal could be realized only during 2006 to 2011. The goal of achieving the replacement level of fertility would be postponed by another ten years.

In terms of specific family planning goals, the following targets were stipulated to be realized by 1990:

1. An effective couple protection rate of 42 percent
2. Crude birthrate of 29.1
3. Crude death rate of 10.4
4. Infant mortality rate of 90 per 1,000 live births
5. Universal immunization of children
6. Antenatal care for 75 percent of all pregnant women.

To reach these targets, particularly 42 percent couple protection, the seventh plan stipulated 31 million sterilizations, 21.25 million IUD insertions, and 14.5 million users of conventional contraceptives by the end of 1989-90. Special schemes for improving program efficiency and effectiveness in five states--Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, and West Bengal--were also formulated. The interesting and welcome fact is that most of the goals set for the Seventh Five-Year Plan, to be realized by 1990, seem to have been achieved (Table 2.1).

To achieve the long-term demographic goals, launching special educational programs through the mass media for enlightening people on the benefits of late marriage was proposed. Methods of social enforcement of the minimum age at marriage have been suggested.

Incentives for attracting younger couples with fewer than two children to accept spacing methods were also proposed. Intersectoral coordination and cooperation and the involvement of voluntary agencies in the program were implemented on a larger scale in the field of health and family welfare. Community participation was proposed to be achieved through the use of nongovernmental organizations, informal community leaders, satisfied acceptors, political leaders, and other social workers.

Special programs to reduce infant mortality to 90 per thousand births per year by 1990 were undertaken, and special schemes for reducing childhood diseases, such as diarrhea, dysentery, and respiratory diseases, were being implemented. An expanded program of immunizing children and oral rehydration therapy for treating diarrheal diseases was launched, especially in the least developed states, with assistance from UNICEF.

Some state legislatures passed unanimous resolutions supporting the family welfare program, and this political commitment enhanced its credibility and boosted the morale of those engaged in the family planning field. It has been proposed to have similar resolutions adopted in other state legislatures. The involvement of political leaders in the program, through the forum of the Indian Association of Parliamentarians for Problems of Population and Development, offers considerable political credibility and stable conditions in which the program can be intensified in future years.

During 1989-90 the cost per sterilization equivalent was Rs. 1129 reflecting the trend of rapid increase in cost since 1976-77 when it was lowest at only Rs. 200/ per sterilization (Table 2.2). With the setback to the program in 1977-78 after the national emergency in 1976-77, the cost per service to the acceptor rose sharply, reflecting the fears of program personnel to act overcautiously. While the number of personnel working in the program and expenditures on infrastructural facilities have steadily increased since 1975-76, the poor performance from 1977 to 1980 has raised per capita expenditure on sterilizations during these years to very high levels. The infrastructure and expenditure on personnel already deployed are definitely capable of yielding a far better performance given a proper political climate, motivation from local leaders, and commitment of personnel.

Per capita governmental expenditure on the family planning program in India was still under Rs. 6 (US 50 cents) in 1984-85, compared to per capita expenditures of US 79 cents in Malaysia (1979), 69 in Singapore (1981), and 62 in the Philippines (1980) and Korea (1979) (Ross et al, 1988). However, in relation to its per capita income, India spends a larger amount from its budget on family planning than most developing countries.

**Table 2.2 Governmental Expenditure on Family Planning Programs:
India, 1951-91**

Five-Year Plan	Period	Expenditure (in Rs.)		
		Total (millions)	Per Capita	Per Sterilization Equivalent
First	1951-56	1.45	0.00	NA
Second	1956-61	21.56	0.05	NA
Third	1961-66	248.60	0.54	NA
Annual	1966-67	134.26	0.27	110.41
	1967-68	265.23	0.52	126.97
	1968-69	305.15	0.59	162.49
Fourth	1969-70	361.84	0.68	218.11
	1970-71	489.04	0.90	306.03
	1971-72	617.56	1.11	248.91
	1972-73	797.48	1.41	236.43
	1973-74	578.46	1.00	469.15
Fifth	1974-75	620.48	1.05	378.80
	1975-76	806.14	1.33	262.75
	1976-77	1729.82	2.79	199.68
	1977-78	933.37	1.48	751.51
Annual	1978-79	1075.45	1.66	576.65
	1979-80	1185.11	1.79	547.39
Sixth	1980-81	1408.98	1.79	568.37
	1981-82	1930.20	2.10	584.55
	1982-83	2883.20	2.79	614.89
	1983-84	3829.84	5.31	666.06
	1984-85	4240.66	5.80	763.40
Seventh	1985-86	4798.09	6.37	719.89
	1986-87	5691.81	7.40	801.21
	1987-88	6009.08	7.67	828.72
	1988-89	6718.44	8.41	926.17
	1989-90	7813.95	9.59	1129.35
	1990-91	NA	NA	NA

Note: NA = not available

Source: India, Ministry of Health and Family Welfare, Department of Family Welfare, (1991) - Yearbook for 1989-90.

The incentives paid to acceptors of various family planning methods, to the motivator, and to medical and paramedical personnel involved in performing the sterilization or IUD insertions have also increased over the years but not to the extent that they play a key role in motivating couples to adopt these methods. Incentive money was introduced in 1957 in Tamil Nadu and Maharashtra as a compensation to vasectomy acceptors for loss of wages during the compulsory postoperative rest period. Even now it is maintained that compensation for lost wages is not really an incentive. In 1985, an acceptor of sterilization got a total cash benefit equal to US \$12-16 plus medicines-- hardly a major inducement for sterilization (see Table 2.3).

The intensity of efforts undertaken by a country on various aspects of its family planning program is a more direct and sensitive indicator of program inputs than just the budget or expenditures. Efforts in various components of the program, such as formulating population policies and political leaders' commitment to them; setting demographic goals and family planning targets; information-education-communication activities; training and developing skilled medical and paramedical personnel; delivering contraceptive services and service-related activities; easy availability and accessibility of services to eligible couples; and record-keeping and evaluation activities have to be of sufficient quality and coverage for the program to have a significant impact on acceptance and use of methods and fertility decline.

In a major attempt at an international evaluation of family planning programs, Lapham and Mauldin (1985) developed a 30-item list of specific program-related activities under four major components:

- policy and stage-setting activities (8 items)
- service and service related activities (13 items)
- record-keeping and evaluation (3 items)
- availability and accessibility of contraceptives (6 items).

They ranked the country's efforts on a scale of 0 to 4, from very little or no activity to maximum effort or activity on each item based on responses to a questionnaire about the program from about 400 informed judges selected from among population specialists or researchers in different countries in 1983-84. Based on the data collected, Lapham and Mauldin made detailed analyses of the influence of program efforts on the use of contraceptive method in different socioeconomic settings for 79 developing countries. For the 30 items, the maximum score possible for any country is 120 and the minimum is zero. The study was repeated by Ross and Mauldin in the same countries in 1989 and the change in the program effort scores in various components computed (Ross et al., 1992). We can presume that countries with a higher score on all the 30 items have a higher level of program effort than countries with lower scores.

See Table 2.4 for data extracted from the work of Lapham and Mauldin providing the scores for 1982 and Ross and Mauldin for 1989 on the program effort scores for the 12 largest developing countries of the world with populations of 50 million or more. The scores are given as percentages of the maximum possible score in each component or of the total. India's 1982 score ranked it fourth below China, Indonesia, and Mexico. In 1989, India improved its overall program effort score somewhat, but so did other countries, and tied with Bangladesh for fourth position below the same three countries. Thus, program efforts have not shown much improvement in India compared to other large countries.

Table 2.3 Family Planning Incentives Offered by Central Government: India, 1964-83

Effective Date	Incentives for Sterilization Acceptors (in Rs.)						Incentives for IUD Acceptors	
	Men			Women			Lost Wages	Other
	Lost Wages	Drugs, Meals, Transport	Other	Lost Wages	Drugs, Meals, Transport	Other		
December 1964	10	10	0	10	10	0	5	NA
October 1966	30	10	SA	40	10	SA	11	NA
June 1972	35	10	SA	45	10	SA	15	NA
April 1974	20	15	0	25	45	0	6	2.0
April 1976								
Acceptors with								
2 children	100	20	30	100	40	10	6	2.0
3 children	50	20	30	50	40	10	6	2.0
4+ children	25	20	25	25	40	5	6	NA
1977	70	20	10	70	40	10	6	2.0
February 1983	100	40	30	100	70	30	9	2.5

Note: NA = not available; SA = small amount, varying slightly from state to state

Source: India, Ministry of Health and Family Welfare, Department of Family Welfare, 1991

Judging the scores of the countries in the four broad areas of program activity, while India fared relatively well in policy and stage-setting (ranking 2 in both years) and service and service-related activities (third in 1982 but seventh in 1989), in the other areas scores were somewhat poorer in India, ranking fourth to sixth in 1982 and 1989. In availability and accessibility of services, India improved from 1982 to 1989. However, the level of contraceptive use in India (percentage of currently married women in the reproductive ages [15-44] using any method of artificial or natural contraception) was far lower in comparison to program efforts, estimated at 32.4 in 1982 and 45 in 1990, placing India eighth among the 12 large developing countries in both years. Only Egypt, Bangladesh, Pakistan, and Nigeria recorded contraceptive prevalence rates below India's. In India, despite substantial efforts in every aspect of the family planning program, the impact achieved in increased contraceptive prevalence levels is not commensurate with its efforts. The impact appears to be significantly lower than expected compared to other large developing countries.

The Eighth Five-Year Plan, 1992-97

This eighth plan should have logically covered the period 1990-95 as a follow-up of the seventh plan 1985-90. However, because of rather frequent changes in the central government in 1990 and 1991, its formulation was postponed and only annual plans were implemented during 1990-91 and 1991-92. The Eighth Five-Year Plan document was approved to cover 1992-97.

The eighth plan seems to have initiated a process of liberalization of the economy, and shifting the roles of government and public sector enterprises so that the dependence of the economy on these institutions is reduced. Such a shift seems to have followed global trends. Planning would be largely indicative. "So far, resource allocation has been the predominant role of the Planning Commission. This has to change. . . . The Planning Commission has to play a mediatory and facilitating role among States and sometimes Central Ministries" (Plan Document, 1992, (8th Plan, Draft), p.3). Planning is still considered necessary for creating a social infrastructure to care for the poor and to reduce regional disparities. While the role of the public sector is sought to be reduced considerably, it would continue to play a leading role in providing infrastructural facilities.

Keeping in view the philosophy above, the Department of Family Welfare is interested in promoting the role of nongovernmental organizations in the program and improving service quality at the periphery. Renewed emphasis is also being given to activities related to information, education, and communication. As a special feature of the eighth plan, 90 districts have been identified as "backward" in terms of demographic parameters, especially the crude birth rate, and special intensive family welfare programs in these districts are being envisaged in this plan period. The demographic goals set for the eighth plan period appear in Table 2.1. The specific operational details of the plan are yet to be made available.

Table 2.4 Program Effort Scores on Family Planning Program Components and Contraceptive Prevalence Rate for 1990: 12 Large Nations, 1982 and 1989

Country	Total Score		Program Effort Component Scores								Contraception Prevalence Rate 1990
			Policy & Stage Setting		Service & Service- Related		Record Keeping & Evaluation		Availability & Accessibility		
	1982	1989	1982	1989	1982	1989	1982	1989	1982	1989	
Maximum Possible Score	120	120	32	32	52	52	12	12	24	24	
China	84	87	97	95	78	80	57	67	96	100	75
India	66	72	81	81	62	63	60	58	58	87	45
Indonesia	75	80	77	81	78	83	93	83	57	69	52
Brazil	43	32	36	41	36	20	67	0	53	61	69
Bangladesh	57	72	58	73	55	73	43	56	68	78	33
Nigeria	13	43	18	50	11	46	11	42	10	28	7
Pakistan	40	48	59	58	28	49	53	54	37	28	15
Mexico	66	77	71	71	60	73	65	82	75	93	58
Philippines	56	49	57	51	52	48	47	39	67	57	49
Thailand	61	80	52	69	53	79	72	89	84	94	74
Turkey	29	46	60	40	16	43	29	48	17	58	66
Egypt	40	66	50	71	38	65	25	67	36	60	41

Note: Scores for each country are percentages of maximum score possible in each component or total.

Source: Ross et al., 1992

Chapter 3

NATURAL FERTILITY AND NUPTIALITY

VALUES RELATED TO FERTILITY AND PROXIMATE VARIABLES

India, with its unbroken history of over 4,000 years, has developed its own philosophical and cultural systems that consciously and unconsciously influence the emotions and behaviors of its people. The epics of Ramayana and Mahabharata, stories which parents and grandparents tell every child in India, inculcate directly and indirectly the values of life and the criteria for judging the opposites--good and bad, vice and virtue, and so on. Similarly, the various philosophical works such as the Upanishads and Bhagavadgita impart the goals of life, the doctrines of reincarnation and Karma, the roots of happiness and sorrow, and the various duties of individuals to their parents, teachers, gods, and fellow human beings.

Cultural values and norms for marriage and sexual activity and duties to parents, spouse, and children are very elaborate and demanding and influence Indian fertility levels and patterns. When life expectancy at birth was quite low, perhaps between 20 and 25 years, it was necessary for the survival of the people for Indian culture to incorporate specific values which would ensure moderately high fertility--early marriage of girls, bearing the first child as early as possible after marriage, ensuring the survival of children already born, care and nurture of pregnant women to enable successful parturition, and various practices of infant and child care. Many of these values and norms have been institutionalized and given religious sanctity to ensure adherence by as large a section of the people as possible.

Over the centuries, the Indian social system also recognized that the optimal path of survival, in the face of high mortality, is one of having moderately high fertility levels, neither very high nor very low fertility. When infant and child mortality levels are very high, the population learned from experience that closely spaced births reduced further the chances of survival of the child already born. Hence came the custom of a pregnant woman's going to her mother's home for delivery (especially for the first two or three children), where she had better attention and rest, returning to her husband's home only a year or longer after delivery. Long periods of postpartum abstinence were recommended and found socially desirable as a means of protecting children's health. Similarly, prolonged breastfeeding was also recommended and practiced. Couples have practiced periodic abstinence for religious and health reasons and terminal abstinence after reaching a certain age or a stage of the life cycle--such as after son's or daughter's marriage. These traditional and cultural checks on fertility were directed and institutionalized to optimize child survival.

Though there was a social and cultural stigma attached to an infertile woman, the woman with a larger family with poorly spaced births was also an object of ridicule and of

the sarcastic remarks popular in most of the Indian languages. For example, in Tamil there is a popular saying that "even a king will become a pauper if he has five daughters."

On the other hand, there was strong religious and social pressure for couples to have a male child as quickly as possible after marriage. Couples who had a baby boy first were considered the luckiest. Roots of the patriarchal and patrilineal system of family life and inheritance can be traced back to the Vedic periods and can be considered part of the collective consciousness of the Hindu society. A son was considered necessary not only for continuation of the family line or gothra lineage, but also to care for the departed souls of parents and grandparents by offering prayers and gifts every year on their death anniversaries. Life in this world, and of the soul in the other world after death, was considered incomplete and unfulfilled without a son. Those who had no son were permitted to adopt a daughter's child as their son after an appropriate religious ceremony. After adoption, the grandson took over the religious functions of a son.

Thus we see that in Hindu society, the cultural and social systems have developed over the ages with a view to maximizing children's health and longevity in the face of a high-mortality situation. The values and norms developed to realize this goal were oriented towards early marriage, having the first child as soon as possible after marriage, good birth spacing by observing lengthy postpartum abstinence, prolonged breastfeeding, periodic abstinence for religious and social reasons, emphasis on having a son, and terminal abstinence at a relatively young age.

It is interesting to observe a number of built-in traditional and religious checks on fertility along with emphasis on early marriage, son preference, and stigma related to infertility. Women's low status, assigned in the laws of Manu (Manusmriti), the earliest text in Sanskrit written over 2000 years ago, placed high emphasis on a girl's marrying as early as possible and having a son very quickly to raise her social status. The net effect of various positive and negative checks on fertility fluctuated over time with the intensity with which they were practiced; but it can be inferred from historical records that extramarital fertility was insignificant and that within marriage it never reached the biological maximum levels.

The variables through which the social, economic, and cultural environment influence fertility have been termed the intermediate variables by Davis and Blake (1956). They categorize and list these 11 variables in a framework that has become an important aspect of demographic analyses of fertility studies. According to this framework, any change in the fertility levels of a population can be brought about only by changes in one or more of 11 intermediate variables. The variables are grouped into three categories:

- factors affecting exposure to intercourse (intercourse variables)
- factors affecting exposure to conception (conception variables)
- factors affecting gestation and successful parturition (gestation variables).

For a schematic diagram of the intermediate variable framework, including the normative part of it within a cultural framework as given by Freedman (1961) and the listing of the 11 intermediate variables, see Figure 3.1.

The effects of cultural and traditional norms on each of the intermediate variables are not necessarily unidirectional. For example, the prohibition on widow remarriage, socially and culturally imposed on many segments of the Indian society, tends to reduce fertility below the biological maximum by withdrawing women from reproduction over a considerable span of their fertile period when they are widowed. In a high-mortality situation, when girls marry very young and husbands are older than their wives, the span of female reproductive life eliminated because of widowhood can be considerable. On the other hand, the universality of marriage for women and the young age at marriage can be expected to contribute to increased fertility.

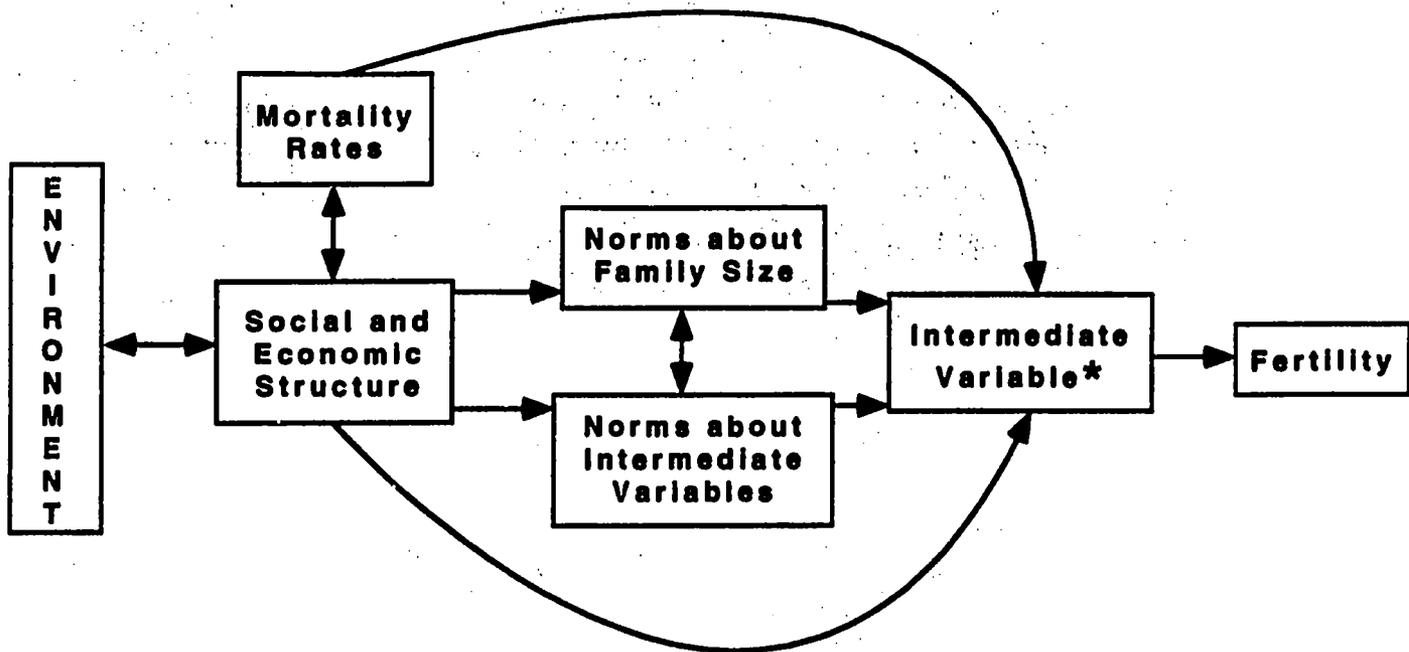
The fertility-enhancing or depressing effects of the dominant norms of a Hindu society on each of the intermediate variables appear in Table 3.1. A positive (+) sign indicates that the effect of the particular norm is to increase fertility and a negative sign (-) indicates the opposite. In a traditional Hindu society, many of the norms on intermediate variables, such as prohibiting widow remarriage, voluntary abstinence for religious or social reasons, decreased coital frequency because of men's value on preserving semen, and impaired fecundity because of febrile illnesses, tended to depress fertility; norms on other variables (age at marriage, universality of marriage, and taboos on induced abortion) tended to enhance fertility. A detailed investigation of the nature of changes taking place in these intermediate variables through modernization, and the resulting effects on fertility, comes later in this chapter.

HISTORICAL NATURAL FERTILITY LEVELS

Based on studies of historical demographic data, various scholars of Indian demography have recognized that fertility levels in India have never been very high at any time in the past because of the social and cultural effects mentioned above. Such a conclusion is supported from independent analysis of data from three sources:

1. population age distributions from the decennial censuses conducted since 1881 through recently developed techniques of generalized stable population theory
2. a careful analysis of pre-1962 sample survey data when there was very insignificant contraceptive use in the country
3. data on vital registration in selected areas where the registration system for births and deaths was considered to be of fairly high quality with complete and accurate registration of vital events.

Figure 3.1 Schematic diagram of factors affecting fertility by Freedman including intermediate variables by Davis and Blake



* There is a limited set of variables through which any social or environmental variables must act to affect fertility. These are what Kingsley and Judith Davis call "intermediate variables." See Kingsley Davis and Judith Blake Davis, "Social Structure and Fertility: An Analysis Framework," *Economic Development and Cultural Change*, Vol. 4 (1958), p. 211-235. They include:

1. Factors Affecting Exposure to Intercourse ("Intercourse Variables")

- (A) Those governing the formation and dissolution of unions in the reproductive period
 - (i) age of entry into sexual unions
 - (ii) permanent celibacy: proportion of women never entering sexual unions
 - (iii) amount of reproductive period spent after or between unions
 - (a) when unions are broken by divorce, separation or desertion
 - (b) when unions are broken by death of husband
- (B) Those governing the exposure to intercourse within unions
 - (iv) voluntary abstinence
 - (v) involuntary abstinence (from impotence, illness, or unavoidable but temporary separations)
 - (vi) coital frequency (excluding periods of abstinence)

2. Factors Affecting Exposure to Conception ("Conception Variables")

- (vii) fecundity or infecundity, as affected by involuntary causes
- (viii) use or non-use of contraception
 - (a) by mechanical and chemical means
 - (b) by other means
- (ix) fecundity or infecundity as affected by voluntary causes (sterilization, subincision, medical treatment, etc.)

3. Factors Affecting Gestation and Successful Parturition

- ("Gestation Variables")
 - (x) fetal mortality from involuntary causes
 - (xi) fetal mortality from voluntary causes

Any explanation of fertility trends and variations must include as a final step in the causal sequence changes in one or more of these "intermediate variables."

SOURCE: FREEDMAN (1981-82)

Table 3.1 Cultural Values and Traditional Norms on Intermediate Variables and Their Effects on Fertility: India

Intermediate Variable	Cultural Value	Traditional Norm	Effect on Fertility
INTERCOURSE VARIABLES (Those governing union formation and dissolution)			
Age of entry into sexual union	Premarital sex forbidden strictly for females	Early age at marriage, preferably before menarche	Positive (+), by increasing reproductive span
Permanent celibacy—proportion of women not entering sexual union	All women obligated to marry and beget children	Practically no woman remained single voluntarily	Positive (+), by ensuring almost 100% of females marry by age 20
Amount of reproductive period spent after union or between unions			
After unions broken by divorce, separation, or desertion	Formal divorce sanctioned only in extreme circumstances	Separation and desertion of married women not infrequent	Negative (-), by reducing exposure to intercourse for women after separation or desertion
When unions are broken by husband's death	Widow remarriage prohibited for higher castes, not for lower castes	Widows ill-treated, socially condemned in higher castes; in lower castes, remarriage of young widows not infrequent	Strongly negative (-); in high mortality situation, prevents high proportion of widows age 15-44 from reproducing
Exposure to Intercourse within Unions			
Voluntary abstinence	Highly cherished value—preserving semen considered good for body and soul Women cherished abstinence during lactation, fearing semen might pollute breast milk Couples not to have children after their own children marry	Sexual taboo several days per month based on moon phases; expected on most religious occasions Long periods of lactation, postpartum abstinence common Terminal abstinence practiced at relatively young age by couples	Strongly negative (-), by reducing coital frequency in menstrual intervals, postpartum, and encouraging terminal abstinence at relative young age
Involuntary abstinence (impotence, illness, unavoidable and temporary separations)	Sexual intercourse during illness considered unhealthy; separations not frequent	Impotence not reason for divorce or separation; sex considered blasphemous if smallpox, chicken pox, measles in household; sex felt to invite wrath of goddess controlling these diseases	Strongly negative (-), in context of high morbidity from febrile diseases (malaria, TB), viral epidemics (smallpox, chicken pox, measles); sex during child's illness felt to worsen disease prognosis
Coital frequency (excluding period of abstinence)	High value placed on preserving semen; in some caste groups coitus considered necessary only for procreation	Low coital frequency desired	Negative (-)

Table 3.1 Continued

CONCEPTION VARIABLES			
Fecundity or infecundity as affected by involuntary cases	Female sterility a great social stigma Great social and religious significance in begetting a son	Bride's first pregnancy eagerly awaited Inability to conceive for several years sufficient reason for husband to remarry Birth of sons welcomed and celebrated	Positive (+)
Use or Nonuse of Contraception			
Mechanical or chemical methods	Permitted when spacing or limitation necessary	Nothing seems to have been practiced as commonly accepted method.	Positive (+)
Other means	Permitted	Some herbals used as contraceptives, with unknown effectiveness	Positive (+)
Fecundity or infecundity as affected by voluntary causes (sterilization, medical treatment, etc.)	Permitted as long as woman has son; fecundity after daughter is grown or son married considered shameful	Terminal abstinence practiced at young age as "grandmother complex"	Strongly negative (-)
GESTATION VARIABLES			
Involuntary fetal mortality	Considered curse or wrath of god	Various appeasement procedures and traditional forms of treatments resorted to Care of pregnant woman in mother's home	Positive (+)
Voluntary fetal mortality (induced abortion)	Not condemned in high-parity women	Traditional methods available with unknown effectiveness	Negative (-)

AS

Louis Henry (1961) defines natural fertility as the marital fertility prevailing in a population in the absence of any deliberate birth control. Based on an analysis of data on age-specific marital fertility rates collected from 13 populations with no use of contraception, which Henry considered to be under natural fertility conditions, he derived certain properties of such fertility schedules. Nine schedules related to European-origin populations (mostly French speaking) for whom data were compiled from parish records, some as early as 1600 AD. Four schedules were from Guinea, India, Iran, and Taiwan, using data from surveys considered to be reliable. Henry made two major observations from his analysis of fertility schedules:

1. Populations can differ widely in their natural fertility levels. For example, the total marital fertility rates among women aged 20-49 among the 13 schedules Henry studied ranged from 6.1 in Hindu villages of Bengal in 1945-46 to 10.9 among Hutterite women (French-Canadian) married during 1921-30. The natural fertility of the Hindu women was only 57 percent of that of the Hutterite women.
2. In spite of substantial differences in natural fertility levels among the 13 groups included in the study, their age patterns of fertility were essentially the same. The curves of age-specific marital fertility rates were almost parallel for different populations.

Data on natural fertility levels and patterns, available from different parts of India, reveal not only substantially lower levels of natural fertility than in Western populations but substantial regional variations. Data on age-specific marital fertility rates were compiled from surveys or studies in different rural parts of India prior to 1962, when contraceptive practice was low and insignificant and it can be presumed that women had close to natural fertility levels. After reviewing data on fertility schedules from a number of surveys and studies from different parts of the country, data compiled from ten large-scale national or regional sample surveys were considered. These included a 1958-59 all-India National Sample Survey, a local survey in Bengal, three south Indian surveys, three data sets from the north, a survey from central India, and one from western India. These studies were felt to be carefully conducted inquiries yielding relatively high-quality data and quoted frequently in the Indian demographic literature. These data sets were taken from a slightly larger set compiled by Mari Bhat (1978). See Table 3.2 for a brief statement on the surveys and the age-specific marital fertility rates compiled from them.

The mean value of the total marital fertility rate (TMFR) for ages 20 to 49, averaged over the ten data sets, is 5.5 compared to an average TMFR of 8.4 for the same age group Henry studied (Table 3.2). This implies that the Indian TMFR, even in the absence of contraception was only 65 percent of the average of the 13 schedules. Henry did not include women aged 15-19 in his analysis of marital fertility because of significant numbers of premarital pregnancies in this group in the European populations he studied. If we relate Indian TMFR at ages 20-49 to the average TMFR of only the nine European schedules of marital fertility Henry studied (Table 3.2), yielding a TMFR value of 9.2, the ratio works out to only 60 percent. While at age 20-24 the average Indian marital fertility rate is 66 percent of European fertility, at ages 35-39 and 40-44 rates were still lower at 52 and 37 percent compared to European fertility. Not only was the level of Indian natural fertility lower but also the age pattern

Table 3.2 Age-Specific Marital Fertility Rates from Ten Selected Studies Compared with European Pattern of Natural Fertility: Rural India, 1945-62

Study or Area	Survey Dates	Age Group							Total Marital Fertility Rate
		15-19	20-24	25-29	30-34	35-39	40-44	45-49	
Bengali Rural Hindu Women ^a	1945-46	0.118	0.323	0.288	0.282	0.212	0.100	0.033	6.19
Ramanagaram Health District ^a	1950	0.117	0.314	0.264	0.201	0.146	0.024	0.001	4.75
Mysore Rural Hill (Zones 1 & 2) ^b	1952	0.282	0.337	0.317	0.232	0.163	0.057	NA	5.53
Mysore Rural Plains ^b	1952	0.277	0.293	0.302	0.170	0.157	0.061	NA	4.92
Poona District ^c	1952	0.231	0.290	0.267	0.212	0.142	0.071	0.027	5.05
Banaras Tahsil ^d	1956	0.220	0.340	0.320	0.240	0.160	0.120	0.060	6.20
Punjab Chamars ^e	1959	0.277	0.370	0.357	0.346	0.259	0.113	NA	7.22
Punjab Rural ^f	1961-62	0.209	0.303	0.295	0.254	0.164	0.087	NA	5.52
Madhya Pradesh Rural ^g	1961-62	0.186	0.270	0.253	0.208	0.152	0.086	NA	4.85
NSS Rural 14th Round ^h	1958-59	0.195	0.283	0.258	0.205	0.147	0.064	0.025	4.91
Average (India)	Prior to 1962	0.211	0.312	0.292	0.235	0.170	0.078	0.014	5.51
Average of 13 schedules ⁱ	1600-1955	NA	0.435	0.403	0.371	0.298	0.152	0.022	8.42
Average of 9 European schedules ^j	1600-1920	NA	0.470	0.442	0.404	0.329	0.173	0.025	9.21

Note: NA = not available

Sources: Adapted from Srinivasan, 1988c, Table 1; ^aChandrasekaran, 1954; ^bUnited Nations, 1961; ^cDandekar, 1953; ^dRele, 1962; ^ePotter, 1965; ^fKumar, 1971; ^gIndia, Registrar General, 1964; ^hIndian Statistical Institute, 1963; ⁱHenry, 1961; ^jcomputed from Henry, 1961, omitting Iran, India, Taiwan, and Guinea and including only schedules of European fertility

differed from European fertility. Indian women seem to have completed their childbearing earlier by resorting, possibly, to terminal abstinence based on a "grandmother complex."

While the average marital fertility rate for ages 15-44 is 6.5 for the ten data sets for India, they varied from 5.3 in Mysore to 8.5 in Punjab. Thus, even under natural fertility conditions, with no use of modern contraception, there is substantial variation in fertility in different areas of the country. The major proximate determinants of natural fertility are breastfeeding duration, norms of sexual abstinence, biological levels of fecundity, and extent of spontaneous fetal loss. Any differences in observed natural fertility should be explained in variations in one or more of these proximate determinants. Unfortunately, since we do not have data on these proximate variables in different parts of the country where the surveys were conducted and for the same periods, it is difficult to separate out their contributions to variations in natural fertility. We can only conclude that one or more of these determinants varied among different regions of the country.

NUPTIALITY LEVELS

The levels and patterns of natural fertility described above pertain only to the fertility of married women, with husbands alive during the periods for which the analyses are made. A population's overall fertility, computed in measures such as the crude birth rate or total fertility rate, is a function of marital fertility levels, proportions married at different ages, and the age-sex distribution. Total fertility in a population can have substantial variation, even under a specified natural fertility schedule, depending on the variation in the proportions married at different ages for women within the reproductive span. Similarly, crude birth rates, under a specified natural fertility regime, can vary substantially depending on the age-sex-marital distribution of the population.

Prepubertal and child marriages were widely practiced in India from time immemorial and even now are practiced in sizeable number (but in decreasing proportions in many communities) especially in the northern states. By the age of 20 most of the women in India are married. This custom of child marriage was institutionalized in the Hindu religion by ascribing a good deal of Punyya or merit to parents who give their daughter in prepubertal marriage to an eligible bachelor. Early age at marriage and universality of marriage are typical of Indian society and very different from practices in Western culture. In Western societies, even in the 17th and 18th centuries bridal age was quite high according to historical demographic data. A considerably high proportion of women remained single throughout their lives (see Table 3.3).

Even as early as 1700, the mean age at marriage for many European women was much higher than that of Indian women two centuries later. The proportions of women remaining single had always been lower in India (about 1-2 percent) than in European societies (10-20

Table 3.3 Mean Age at Marriage of Women: Selected European Countries, 18th-19th Centuries, and India, 20th Century

Country	Time Period		
	Pre 1750	1740-90	1780-1820
Belgium	25.0	24.8	27.9
England	25.0	25.3	24.2
France	24.6	26.0	26.7
Germany	26.4	26.9	27.5
Scandinavia	26.7	25.5	29.8
India	1901-11 12.0	1941-51 15.4	1971-81 18.4

Source: Srinivasan, 1988c, Table 2

percent). Effects of Indian customs of early and universal marriage have been to maintain relatively high fertility levels.

In the previous paragraphs we found that the natural fertility levels of women in India were substantially lower than those of Western women. This low level of natural fertility was compensated to some extent by the high proportions of younger women married in India.

Universal marriage and the low ages of brides ensured that the proportions married in each age group, especially up to 30 when marital fertility rates are maximal, were very high. High mortality in the past and the prohibition of widow remarriages among higher castes contributed to a reduction in the proportions currently married among women over 30. On the whole, the universality of marriage and low age at marriage contributed to raising the crude birth rate and total fertility rate to moderately higher levels. Had the nuptiality patterns in India remained at European levels, these coupled with India's low natural fertility would have resulted in a much lower birth rate and total fertility rate and population survival would have been jeopardized.

As an example, the natural fertility levels of European and Indian women (seen as averages in Table 3.2) are combined with proportions married in the reproductive ages in France (1946) and India (1931) and the resulting crude birth rate (CBR) and total fertility rate (TFR) computed for India (for the age-sex distribution prevailing in 1931). In 1931, natural fertility levels of India when applied to the age-specific marital status distributions yielded a CBR of 45.4 and a TFR of 5.7. Had European natural fertility prevailed with Indian nuptiality, the 1931 CBR in India would have been as high as 76.5 and the TFR, 9.7. But, had Indian natural fertility prevailed with French nuptiality, the CBR would have been as low as 29.3 and TFR, 3.8. Thus while Indian nuptiality contributed to a 16.1 point increase in the CBR of India compared to what could have been with European nuptiality, India's natural fertility pattern produced a decline of 31.2 points in the CBR from what could have occurred with European natural fertility. Thus India's low natural fertility had, for a long time, kept fertility at moderate levels, despite very young brides and universal marriage which tended to increase fertility.

From an analysis of the trends in crude birth rates and total fertility rates estimated for the area of Berar in central India, from 1881 to 1970, where registration data were considered to be very high quality and with almost total coverage, Tim Dyson (Dyson and Murphy, 1986) concludes that the average CBR for 1881 to 1970 was 41.5 with a total fertility rate of only 5.29 (Table 3.4). However, over individual decades the CBR varied from 38 to 47 and the TFR from 4.88 to 6.0. Similarly, based on an analysis of the census age distribution using generalized stable population theory, Mari Bhat (1986) estimated that the TFR of India for 1881 to 1961 varied within a narrow spectrum of five to six children per woman. Earlier CBR estimates prior to 1921 by census actuary, Kingsley Davis (1951) by the reverse survival ratio method, or using stable population theory seem to have been higher, exaggerating the true

level of Indian fertility (Table 3.5). Recent estimates based on the census age distribution of the population, vital registration in areas where it is complete and accurate, and data from carefully conducted sample surveys confirm that total fertility in India fluctuated between five and six children in recent history.

MODERNIZATION AND NATURAL FERTILITY CHANGES

Modernization can be defined as the process of transforming a society from its traditional values to a modern set of values and associated behavioral changes (Inkeles and Smith, 1974). In Europe, modernization seems to have begun in the late 17th century and swept through country after country, then in North America and Oceania, changing religious beliefs and dogma, occupational structure, economic conditions, and almost all aspects of life. In Asia, Japan led the process of modernization in the late 19th century. Modernization has brought macrolevel economic and social changes.

On the economic side modernization involves a sustained rise in real output per head and wide ranging changes in techniques of producing, transporting, and distributing goods, in the scale and organization of productive activities, and in types of outputs and inputs. It also embraces major shifts in the industrial, occupational, and spatial distribution of productive resources and in the degree of exchange and monetization of the economy. On the social and demographic side, it involves significant alterations in fertility, mortality, and migration, in place of residence, in family size and structure, in the educational system, and in provision for public health. Its influence extends into the areas of income distribution, class structure, government organization, and political structure. In terms of human personality, modernization is characterized by an increased openness to new experience, increased independence from parental authority, belief in the efficacy of science, and ambition for oneself and one's children (Easterlin and Crimmins, 1985, pp. 3-4).

The process of modernization, as defined above, was ushered into India on an extensive scale in the middle of the last century with Macaulay's introduction of Western-style education in 1835 (Allen et al, 1969; Biswas and Agarwal, 1986) and census taking in 1872. Western-style education has modified many traditional values for marriage, family ties, kin and caste relationships, and attitudes on various religious beliefs and dogmas. These changes have had an impact on Indian fertility by altering natural fertility and nuptiality patterns. With the attainment of political independence in 1947 and the launching of various developmental plans for economic and social betterment of the people, modernization has accelerated in India with varying degrees of impact in different parts of the country. Many of the proximate determinants of natural fertility are changing with modernization.

As a part of the development strategy, a series of five-year plans have been implemented since 1951. As discussed in Chapter 1, even before the attainment of political

Table 3.4 Fertility Estimates: Berar, 1881-1970

Period	Crude Birth Rate	Total Fertility Rate
1881-1890	39.4 (40.8)	5.10
1891-1900	38.3 (38.4)	4.78
1901-10	47.1 (49.3)	5.65
1911-20	45.6 (46.8)	6.02
1921-30	44.1 (46.5)	5.79
1931-40	40.7 (41.0)	5.12
1941-50	38.6 NA	4.75
1951-60	38.4 NA	4.75
1961-70	41.1 NA	5.66
Average	41.5 -	5.29

Notes: Berar comprises the four districts of Akola, Amravati, Buldana, and Yeotmal in Maharashtra. Figures in parentheses are corresponding averages of official rates. NA = not available.

Source: Estimates from Dyson and Murphy, 1986, based essentially on vital registration data

Table 3.5 Fertility Estimates: India, 1881-1961

Period	CBR	CBR ^c	CBR ^d	TFR ^d
1881-1891	48.9 ^a	NA	46.6	5.76
1891-1901	45.8 ^a	49	46.2	5.73
1901-11	49.2 ^a	50	46.4	5.72
1911-21	48.1 ^a	50	45.6	5.70
1921-31	46.4 ^a	48	45.9	5.81
1931-41	45.2 ^b	46	46.2	5.93
1941-51	39.9 ^b	44	45.0	5.91
1951-61	41.7 ^b	45	45.4	6.06

Sources: Adapted from Srinivasan, 1988c, Table 5;
^aKingsley Davis, 1951; ^bRegistrar General; ^cMukherjee,
1976; ^dMari Bhat, 1986

independence, national leaders and planners felt that India's high rates of population growth would impede economic and social development by diverting more and more resources to consumption rather than towards investments for development. They considered it prudent to check the rate of population growth as quickly as possible by lowering fertility levels.

As discussed in detail in Chapter 2, a national program of family planning began in 1952 as an integral part of the First Five-Year Plan. The program was conceived as a time-bound target-oriented program from the very beginning with emphasis on terminal methods of family planning (vasectomy until 1977 and tubectomy thereafter). During the past few years increased emphasis is being placed on spacing methods such as IUDs, the pill, and condoms as part of the overall strategy in the Seventh Five-Year Plan (1985-90). The prevalence of eligible couples protected by a modern method of contraception has steadily increased over the years, largely because of the national program of family planning. Levels and age patterns of marital fertility are thus being altered. Efforts have been made to increase age at marriage through legislation and education. Thus modernization seems to have affected Indian fertility levels in three distinctive ways:

1. Modification of the natural fertility levels of married women (levels that would have prevailed with no deliberate control of fertility by couples)
2. Modifying couples' actual fertility levels because of increased contraceptive practice
3. Changing overall fertility levels by altering women's nuptiality patterns, especially through changes in age at marriage, proportion ever marrying, and extent of widow remarriage.

We will examine the nature of changes that have taken place in the country in each of these three aspects of fertility dynamics.

Modernization and Changes in Natural Fertility

Although modernization, in the long run, lowers a population's fertility to replacement or still lower levels, in the short run, certain aspects of modernization may contribute to increased natural fertility.

Studies carried out in the 18th and 19th centuries on European populations from historical demographic data and on contemporary Asian populations, particularly in India, Sri Lanka, and Taiwan, reveal that during the early phase of modernization, natural fertility levels in many countries tend to rise, especially among women below age 30 (Dyson and Murphy, 1985; Easterlin and Crimmins, 1985; Srinivasan and Jejeebhoy, 1981). A major reason for an increase is the loosening of various indirect societal checks on fertility. Many of the traditional checks on fertility within marriage, such as prolonged breastfeeding or sexual abstinence for religious or social reasons, are affected by the processes of modernization.

The general conclusion emerging from these studies is that, in many parts of India, the natural fertility of women in the reproductive ages has risen substantially which could have led to an increase in observed fertility even in the context of an increase in the proportion of couples using modern methods of family planning. The changes in natural fertility levels in India during the past three decades and the factors associated with them are briefly discussed below.

Empirical Support for Increased Natural Fertility Levels in India during the 1950s and 1960s

The substantial body of empirical data on marital fertility patterns compiled at different times in the past three decades in India support the hypothesis that natural fertility systematically increased in a number of states.

From a detailed analysis of data on age-specific marital fertility rates compiled from two large-scale rural sample surveys conducted in 1959 and 1972 in 11 major states in India (Table 3.6), Srinivasan and Jejeebhoy (1981) observed:

The results consistently indicate an increase in the total marital fertility rates in eight of the eleven states (the exceptions being Kerala, Orissa and Punjab) between 1959 and 1972. The most striking increases in total marital fertility have been observed in those states where there has been practically no prevalence of contraception. The increase is 28 percent in Uttar Pradesh, 26 percent in Rajasthan, 13 percent in Madhya Pradesh-- and all these states were practically under natural fertility conditions... (page 103).

In rural Karnataka, despite substantial increase in contraceptive practice during the 13-year period, total marital fertility increased by 2.3 percent. Srinivasan and Jejeebhoy concluded that natural fertility levels may vary widely among populations with a nation at a given time, and, in general, during the early stages of modernization, those levels are likely to rise.

In another detailed study, data from a large-scale survey conducted in 1970 by the Operations Research Group, Baroda, in a sample of households from ten Indian states were analyzed to test the synthetic framework Easterlin (1978) developed for explaining the transition from natural to controlled fertility. The analysis by Srinivasan, Crimmins, Easterlin, and Jejeebhoy (1984) developed a procedure for estimating natural fertility based on the number of children born to continuously married women aged 35-44 who had at least two living children (at the time of the survey in 1970) and observed that in the process of modernization, natural fertility levels tended to increase (see Table 3.7).

Natural fertility levels vary even for fertile women in the same age group (35-39) from 6.4 in Punjab to 5.5 in Madhya Pradesh (Table 3.7). Levels are generally higher in states relatively more advanced in various developmental criteria. The correlation coefficient between the observed fertility levels (CEB) and the percentage using contraception (CPR) is

Table 3.6 Observed Age-Specific Marital Fertility Schedules, Rural Areas of Selected States: India, 1959 and 1972

State	Year	20-24	25-29	30-34	35-39	40-44	TMFR (20-44)	No. Households Sampled
Andhra Pradesh	1959	.2742	.2804	.1756	.1034	.0452	4.394	27492
	1972	.3068	.2236	.1783	.1221	.0484	4.396	11186
Gujarat	1959	.3275	.3302	.2759	.1951	.0765	6.026	11376
	1972	.3731	.3615	.2694	.1954	.1110	6.552	10070
Karnataka	1959	.2773	.2846	.1867	.1359	.0465	4.655	11103
	1972	.2812	.2572	.1839	.1342	.0902	4.734	8928
Kerala	1959	.3294	.3468	.2436	.1989	.0637	5.912	8584
	1972	.3631	.3105	.2303	.1571	.0742	5.676	9712
Madhya Pradesh	1959	.2930	.2777	.2582	.1867	.0908	5.532	18468
	1972	.2978	.3266	.2853	.2098	.1346	6.270	5974
Maharashtra	1959	.2945	.2361	.2071	.1340	.0500	4.609	21906
	1972	.2988	.2920	.2039	.1400	.0577	4.912	8752
Orissa	1959	.2971	.2777	.1805	.1369	.0445	4.683	7298
	1972	.2538	.2876	.1848	.1269	.0803	4.667	5350
Punjab*	1959	.3706	.3081	.2983	.1981	.1289	6.520	7351
	1972	.3684	.3554	.3073	.1837	.0954	6.551	7913
Rajasthan	1959	.2971	.2770	.1870	.2151	.0747	5.255	10327
	1972	.3231	.3798	.2839	.2039	.1242	6.574	6797
Tamil Nadu	1959	.2871	.2267	.1447	.0965	.0295	3.923	24773
	1972	.3298	.2577	.1926	.1113	.0511	4.713	11875
Uttar Pradesh	1959	.2896	.2174	.2492	.1763	.0829	5.347	25465
	1972	.3259	.3673	.3125	.2276	.1307	6.820	7772

*1972 rates for the Punjab include Haryana to make them comparable with 1959.

Notes: The remaining states have been excluded for the following reasons: (1) poor 1959 and 1972 data in Assam, Bihar and Jammu, and Kashmir; (2) no 1959 data available for Himachal Pradesh, Meghalaya, Manipur, Nagaland, Sikkim, and Tripura; (3) no 1972 rural data available for West Bengal; (4) boundary changes--Haryana, part of the Punjab in 1959, has been incorporated into the Punjab for the this analysis.

Sources: Srinivasan, 1988c, Table 6; 1959--Rao, 1967; adjusted marital fertility rates obtained from age-specific fertility rates in Indian Statistical Institute, 1963; 1972--Registrar General, 1976a

Table 3.7 Estimates of Natural Fertility (NF), Child Survival (CS), Children Ever Born (CEB), and Proportion Ever Practicing Contraception for Currently Married Women, Married Only Once, Aged 35-44 with Two or More Living Children at Time of Survey: Ten Indian States, 1970

State	NF	CS	CEB	PEPC
Andhra Pradesh	5.86	0.763	5.87	23.8
Gujarat	6.19	0.800	6.04	34.1
Karnataka	6.05	0.813	5.99	17.5
Kerala	5.96	0.864	5.85	5.7
Madhya Pradesh	5.47	0.779	5.49	15.4
Maharashtra	5.86	0.817	5.57	41.1
Punjab	6.40	0.797	5.94	42.4
Rajasthan	6.06	0.746	5.91	19.0
Tamil Nadu	6.18	0.777	5.89	39.1
Uttar Pradesh	6.01	0.720	5.94	12.8

Source: Based on Easterlin and Crimmins, 1985, pp. 154-60

low, 0.02, and not significant from zero. Higher contraceptive use should theoretically imply lower fertility, but since states with greater use also tended to have higher natural fertility in the early 70s, the relation of use and actual marital fertility is not empirically observable. On the other hand, the correlation coefficient between natural fertility (NF) and observed fertility (CEB) is quite high, 0.80, and statistically significant. Observed fertility levels seem to have been more influenced by changes in natural fertility than by changes in contraceptive use until 1970, supporting the view that marital fertility may not decrease during the early phase of fertility transition (it may even increase in some situations) because increased contraceptive use does little more than offset increased natural marital fertility.

The point brought out by the analysis of Srinivasan et al. (1984) is that the relative levels of observed marital fertility, by themselves, are not a good indicator of the stage of demographic transition. Some Indian states are considerably more advanced in motivation for fertility control and show more response in actual use of contraception, even though their comparative levels of marital fertility may differ little from the average. Studying the association among state-level differences in use of contraception and actual fertility, Srinivasan et al (1984) conclude:

This conforms to our expectation that, in the early stages of transition from natural to controlled fertility, observed marital fertility may be constant, or even rising, as the positive effect of higher natural fertility offsets the negative effects of control through contraception. In some states, unregulated fertility may result in greater than average numbers of surviving children because of increase in natural fertility.

Data from a number of localized, large-scale sample surveys conducted in different parts of the country, at different times, reveal a similar finding of increasing marital fertility in the early stage of modernization.

Srinivasan, Reddy, and Raju (1978) compared cumulative and current fertility patterns of largely overlapping and comparable areas covered by the Mysore Population Study conducted in 1951-52 and the Bangalore Population Study in 1975 in Karnataka. Cumulative fertility rates of ever-married women failed to show any decline in any age group in the reproductive span during this 24-year period in spite of substantial increases in contraceptive use in every group during the period. Similarly, the current marital fertility rates of women in 1975 revealed a change in the age pattern from the 1951 rates that cannot be fully accounted for by the phenomena of rising age at marriage and higher contraceptive use at older ages. The natural fertility of married women increased substantially at ages 20-29.

For example, the average number of children ever born to ever-married and currently-married women in Bangalore city rose from 1951 to 1975 even as the proportion ever using contraception grew substantially in all ages in this period (Table 3.8). That greater

Table 3.8 Mean Number of Children Ever Born and Level of Contraceptive Practice for Ever Married and Currently Married Women: Bangalore City, 1951 and 1975

Age Group of Women	Mean No. of Children Ever Born				Percentage Practicing Contraception among Currently Married (aged 15-34) Only			
	Ever Married		Currently Married		All Methods		Modern Methods	
	1951	1975	1951	1975	1951	1975	1951	1975
15-24	1.3	1.4	1.3	1.4	8.5	18.5	2.8	18.5
25-34	3.2	3.4	3.4	3.4	18.7	36.1	6.0	36.1
35-44	4.9	5.2	5.4	5.2	NA	NA	NA	NA
45+	5.3	5.7	5.9	5.8	NA	NA	NA	NA

Note: Data on contraceptive practice collected only for currently married women aged 18-33 in 1951, so comparison is restricted to the age-group 15-34.

Source: Adapted from Srinivasan, Reddy, and Raju, 1977, Table 12; UNDESA, 1961, Table 10.1

percentages of couples were using contraception in 1975 than in 1951 had very little apparent impact on the observed mean number of children born in this age-group.

For ages 20-24 and 25-29, there was also a sharp increase in age-specific marital fertility between 1951 and 1975, in spite of a substantial increase in the percentage who had ever used contraception (Table 3.9). Particularly intriguing is the increase at age 25-29, where the proportion practicing contraception rose by 20.3 percentage points in 24 years. If we consider only modern methods of contraception, the increase was 31.3 points. Since the methods used in 1975 were quite efficient (mostly sterilization and IUDs), one should expect at least a 20 percent decline in fertility between 1951 and 1975 (36.2-15.9), assuming the potential fertility of acceptors was the same as that of all women in the age group. (A number of studies show that potential fertility of acceptors is actually higher than the average for their age group.) The 14-percent increase in marital fertility at ages 25-29 suggests that natural fertility should have increased substantially from 1951 to 1975.

Thus, any analysis of statewide fertility differentials or family planning program impacts on fertility should consider the variations in natural fertility levels and patterns among states at different modernization levels.

MODERNIZATION AND CHANGES IN NUPTIALITY PATTERNS

Modernization, as defined earlier, tends to improve women's status in the society by expanding their literacy and educational levels and their involvement in productive employment outside the household, by giving them equality of opportunity with men in political, administrative, and managerial roles in the society and by increasing longevity and health through improved maternal and child care services. Consequences of such a modernization process is an increased age among brides, a greater proportion remaining single throughout their lifetime, and changes in nuptiality patterns. Indian women's age at marriage has systematically increased since the beginning of the century. Data on trends in age at marriage for different states (or provinces as they were prior to 1956) appear in Table 3.10. For the country as a whole, the mean age for brides rose by 5.2 years from 1901 to 1981. In every decade the lowest age at marriage has been in Uttar Pradesh, where even in 1971 the mean age for brides was around 15 years. As early as 1901 the mean age at marriage of girls in Kerala was higher than that in Uttar Pradesh, Madhya Pradesh, and Rajasthan 80 years later. The Act on Minimum Age at Marriage passed by the Parliament in 1978 stipulates a minimum age of 18 for brides and 21 for bridegrooms, but still a large number of marriages continue to take place below these ages, especially in the north. Any attempt to evaluate the impact of family planning programs on fertility in India should consider the wide variations in nuptiality patterns that continue in different regions.

Table 3.9 Age-Specific Marital Fertility Rates and Contraceptive Use: Bangalore City, 1951 and 1975

Age Group of Married Women	Marital Fertility Rates		Percentage Ever Using Contraception			
			All Methods		Modern Methods	
	1951	1975	1951	1975	1951	1975
15-19	297	290	5.1	NA	1.5	NA
20-24	253	351	10.8	21.3	3.7	21.3
25-29	201	229	15.9	36.2	4.9	36.2
30-34	174	134	22.2	36.0	7.4	36.0
35-39	88	61	NA	NA	NA	NA
40-44	36	16	NA	NA	NA	NA

Note: NA = not available

Source: Adapted from Srinivasan, Reddy, and Raju, 1977, Table 12; UNDESA, 1961, Table 10.1

Table 3.10 Mean Age of Brides of Census-Synthetic Cohorts, Selected States, 1901-81

States	1901	1911	1921	1931	1941	1951	1961	1971	1981
Andhra Pradesh*	12.2	10.8	11.2	10.4	11.8	12.6	15.1	16.2	17.3
Assam	14.9	14.9	15.3	14.9	16.3	16.8	18.5	18.7	NA
Bihar & Orissa	11.4	11.6	12.5	11.2	13.4	14.3	14.6	15.9	17.8
Karnataka	15.1	15.2	15.2	14.6	15.9	16.1	16.3	17.8	19.2
Kerala	17.4	17.7	17.2	17.6	19.3	19.9	19.8	21.0	21.9
Madhya Pradesh	13.0	11.6	12.1	10.7	13.9	14.5	13.9	15.0	16.5
Punjab & Haryana	15.0	14.6	15.1	15.2	15.4	16.1	17.4	18.6	19.5
Rajasthan	13.7	13.0	13.1	12.4	13.5	14.2	14.2	15.1	16.1
Uttar Pradesh	12.3	12.2	12.4	11.7	13.1	13.8	14.4	15.4	16.7
West Bengal	11.4	11.7	12.3	10.7	13.2	14.5	15.9	18.0	19.3
India	13.1	13.2	13.4	12.7	14.7	15.6	15.8	17.2	18.3

*Figures for 1901-51 are for former State of Hyderabad; from 1961 they pertain to present boundaries of Andhra Pradesh.

Note: NA = not available

Source: Based on Sinha, 1987, Table 6.4

Chapter 4

DEMOGRAPHIC AND DEVELOPMENTAL CHANGES

CULTURAL BACKGROUND TO DIVERSITY

In many parts of the world, and for many of its own citizens, India is considered an enigma. India's enigmatic character derives from the opposing or conflicting points of view that find expression and even empirical validation with regard to any sphere of human thought and activity within the country. The enormous diversity of India's people in race, ethnicity, religion, language, and cultural traits makes any generalization for the country at once difficult, if not impossible. Any type of diversity of human nature and culture, observable in the world as a whole, can be found within India.

Indians are racially Armenoids, Proto-Nordic, Mongoloids, and Negroids; skin color ranges from black to brown to yellow and white. Traditional diets vary from rice or chapati-based vegetarian fare to fish and meat (beef and pork) regimens. Despite the common stereotype of universal poverty in India, some people live in affluence comparable to any of the wealthiest nations in the world. Indians may be illiterates or scholars who compete with the best in the world. Indians live in Marxist-Communist ruled states and in states under total entrepreneurial freedom. Fourteen well-evolved major languages are spoken by a population of 20 million or more and another 100 dialects are spoken by a fairly sizeable population. Some population groups like the Parsees have very low birth and death rates, comparable to those in developed countries in the West, and are in the last stage of demographic transition; other populations, like those in parts of Uttar Pradesh and tribal areas, have very high birth and death rates, and are possibly in only the second stage of demographic transition.

Most of these diversities are attributable to India's having been a meeting place of various races from time immemorial. India has been the highway on which has traveled a restless human tide. Even in such a context of extreme diversity and heterogeneity, there appears to be an underlying unity. As noted historian Radhakamal Mukerjee (1959) observes, "There runs, however, through this diversity a principle of unity--a fundamental unity of land, dharma (value system) and culture, a universal pattern of faith conforming to metaphysical frame of social order."

Any analysis of recent changes in Indian population growth and distribution must be seen from the panorama of this enormous diversity of the land and its people, historical and social background, and national and international pressures to curtail population growth. Such a gigantic task goes beyond the objective of this book to study recent trends in population

growth, fertility, and mortality from socioeconomic, public health, and family planning program perspectives. Hence, we will focus on recent trends and diversities in population parameters and their proximate determinants (in time sequence) rather than underlying cultural or racial factors.

TRENDS IN BASIC DEMOGRAPHIC PARAMETERS

Size

India's population is rapidly heading towards the billion mark, expected before the turn of the century. The recent census enumerated the population at 846.30 million on 1 March 1991 (India, Registrar General, 1992). Since 1901 when the population within India's present boundaries was enumerated at 238.4 million, the population has increased by 607.9 million in 90 years. Almost 80 percent of the increase (485.2 million) came after 1951. The spiralling rise in India's population can be gauged from the ten-year period 1981-91, when 163.1 million was added compared to just 123.0 million for the first half of the century (Table 4.1; Figure 4.1). What India has added during the last decade is almost equal to the combined populations of France, the United Kingdom, and Italy in 1980.

India is currently constituted politically into 25 states and seven union territories (federally administered units). The states vary enormously in population size, density, and other characteristics. The most populous is Uttar Pradesh with 139.1 million in 1991 and the least is Sikkim with 0.4 million. India's average density is 274 persons per square km; among the states it varies from 747 in Kerala to 10 in Arunachal Pradesh.

Growth Rate

During the past decade, the population increased by 23.58 percent--an annual rate of 2.12 percent, compared to 24.66 percent--an annual rate of 2.22 percent, in 1971-81. Although the growth rate declined slightly during 1981-91 compared to earlier years when it rose steadily, the decline has been very slow and even by 1990, the barrier of a 2 percent growth rate in the national population does not seem to have been crossed. India's population problem is not only its large size but the persistent high rate of growth.

The picture seems different when we consider the states separately. During 1981-91, Kerala, Tamil Nadu, and Goa registered growth rates of 13.98, 14.94, and 15.96 percent respectively, far lower than the national average of 23.58. These states have recorded a substantial decline in the growth rate compared to earlier decades. On the other hand,

Table 4.1 Demographic Trends: India, 1901-91

Year	Total Population in 000,000s	Density per Km ²	Sex Ratio	Intercensal Estimate of Population Growth & Vital Rates					
				Avg. Annual Growth (%)	Crude Birth Rate (CBR)	Total Fertility Rate (TFR) ^a	Crude Death Rate (CDR)	Life Expectancy at Birth	Infant Mortality Rate (IMR)
1901	238.4	77	972						
1911	252.1	82	964	0.56	49.2	5.77	42.6	22.9	222
1921	251.3	81	955	-0.03	48.1	5.75	47.2	20.0	212
1931	279.0	90	950	1.04	46.4	5.86	36.3	26.8	176
1941	318.7	103	945	1.33	45.2	5.98	31.2	31.8	168
1951	361.1	117	946	1.25	39.9	5.96	27.4	32.1	148
1961	439.2	142	941	1.96	41.7	5.87	22.8	41.3	139
1971	548.2	177	930	2.20	41.1	5.94	18.9	45.6	129
1981	683.2	216	934	2.22	37.2	5.13	15.0	50.5	129
1991	846.3 ^b	274 ^b	927 ^b	2.12	32.6 ^c	4.20 ^c	11.1 ^c	57.3 ^d	96

^aEstimate of TFR 1901-51 by Mari Bhatt, 1989, p. 135; 1951-81 by Rele, 1967

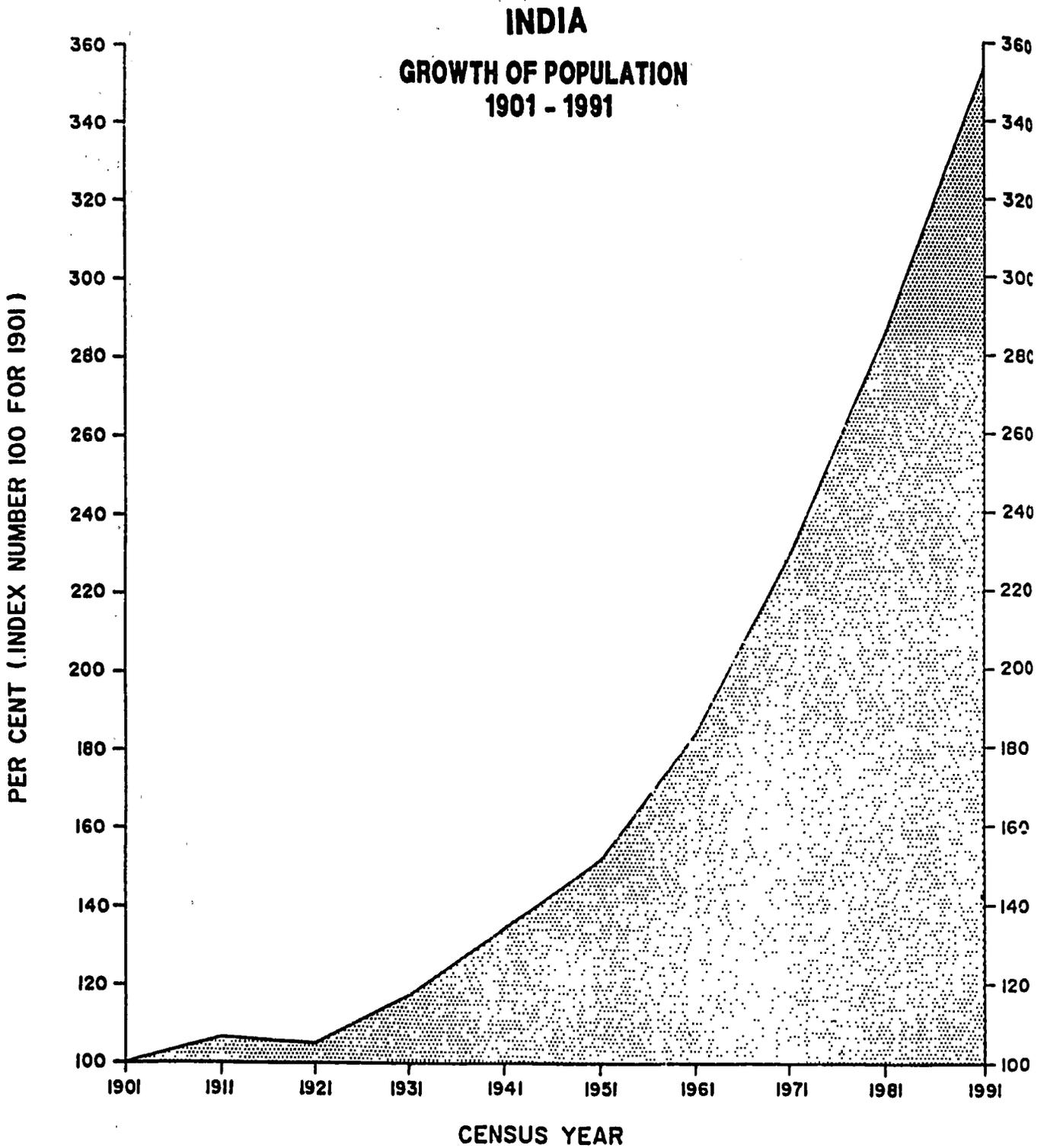
^bThe 1991 census was not held in Jammu and Kashmir. Total population includes projection for Jammu and Kashmir as of March 1, 1991, by the Standing Committee of Experts on Population Projections (October 1989). India, Registrar General, Paper 2 of 1992, p. 78, Table 2.

^cCorresponds to 1986 calendar year for decade 1981-91

^dEstimated for 1981-91 based on Expert Committee on the Population projection using 1981 census; India, Registrar General, 1988

Sources: Publications from the 1981 and 1991 Census of India

Figure 4.1



among the large Hindi-speaking states of Uttar Pradesh, Bihar, Madhya Pradesh, and Rajasthan (euphemistically referred to in Hindi as Bimaru or "sick" states), the growth rate continues to be quite high with decadal increases of 25.48, 23.54, 26.84 and 28.44 percent respectively. Since these states together constitute almost 40 percent of India's population, the prevalence of such high growth rates in such a vast area largely determines the national scene.

Table 4.2 presents data on the population size for the country as a whole, for each of the 25 states and 7 union territories in the years 1901, 1951, 1971 and 1991 and the annual growth rates during the periods 1901-1951, 1951-71 and 1971-91. The purpose is to compare the broad trends in the growth rates of the population over time and to see how different the trends are from state to state since the beginning of this century, as well as before and after the implementation of the various developmental programs since independence. For the year 1991, the final population totals for each state and Union Territory published by the Registrar General in Paper-2 of 1992 based on the 1991 census have been used. It can be seen from the table that for the country as a whole the population growth rates have increase substantially after the launching of various developmental programs since 1951 in comparison to the average levels that prevailed before 1951. During the period 1901 to 1951 the population grew at an average annual rate of 0.84 percent, while in the next two decades, 1951 to 1971, it grew at 2.09 percent per year and in the most recent twenty year period it grew at 2.17 percent per year. The spurt in the growth rate after 1951 can be largely attributed to the national programs of public health and socio-economic development undertaken after political independence. The interesting fact is that even before independence and the launch of national programs of development, there were substantial interstate variations in the growth rates of the population. Considering only the larger states with a population of a million or more in 1901 we find that the states that are considered well advanced at present in terms of demographic transition, such as Kerala, Maharashtra and the north eastern states, grew during the period 1901-51 at a fairly high rate of 1.5 percent or more while the less advanced states such as Uttar Pradesh, and Bihar grew at a very low rate of approximately 0.5 percent per year. Since there had been very little practice of modern methods of contraception before 1951 in any of the states in India, these sharp differentials in the growth rates among the states are mostly attributable to differentials in the mortality rates and to a limited extent to differences in the natural fertility levels of the populations. The states that experienced high growth rates before 1951, such as Kerala and Assam can be considered to have relatively better levels of sanitation and public health and probably better nutrition levels for their people than those that experienced low growth rates. All the states, including Kerala, experienced a sharp rise in their growth rates during 1951-71. The earlier slow irregular declines in the mortality levels experienced in the population

before independence have become sustained steep declines after independence. Among the larger states, Andhra Pradesh, Bihar, Himachal Pradesh, Jammu Kashmir, Karnataka, Punjab, Rajasthan and Uttar Pradesh have continued their rising trends in their growth rates, signifying that their reduction in the fertility levels during this period did not match up with the declines in their mortality levels. In the other states such as Assam, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu and West Bengal, the growth rates during 1971-91 are lower than in the earlier twenty-year period indicating that the populations in these states have reduced their fertility levels at a pace faster than declines in their mortality levels during this period. It can be surmised that while the public health programs continue to have their effects in terms of declines in the mortality levels of the population of all the states, with varying degrees of success, the family planning programs have made their significant fertility-dampening effects since 1971 in the above states.

The variations in the annual growth rates of the Union Territories and smaller states are more influenced by migration than by natural increase. For example, the population of the city of Chandigarh, (which is a Union Territory), grew at a very high rate of 11.86 percent per year, doubling its population every six years, during the period 1951-1971. It has continued to grow, although at a slightly reduced rate of 4.58 percent per year during 1971-91.

Sex Ratio

India shares a distinctive feature of the South Asian and Chinese populations with regard to the sex ratio, with a centuries-old deficit of females to males--the opposite of non-Asian countries. In India the deficit of females is largely attributed to women's lower status in society which has contributed to their higher mortality in all ages up to 45. Of more serious concern to the country is that the sex ratio, defined as the number of females per 1000 males, has been declining almost consistently over the decades, except for a small improvement in 1981. The sex ratio, computed to be 972 in the 1901 census, declined steadily to 930 by 1971, rose marginally to 934 by 1981, but declined subsequently to 927 in the recent census.

In many states, especially the large Hindi-speaking ones, the decline in sex ratio was substantial between 1981 and 1991. For example, in Bihar, it fell from 946 to 911 and in Uttar Pradesh from an already quite low figure of 885 in 1981 to 879 in ten years. Surprisingly, even Maharashtra, considered one of the most progressive states in the country with better status for women, recorded a sex ratio of 934 in 1991 compared to 937 in 1981. Only in Kerala, has the population favored females throughout this century, with 1036 females per 1000 males in 1991, followed by Himachal Pradesh with 976. Thus, the Indian population, except for Kerala, has had a deficit of females to males throughout the century.

Table 4.2 Population Size and Growth Trends in India and the States Since the Beginning of this Century

Serial Number	STATES	Population size in thousands				Annual growth rate, percent		
		1901	1951	1971	1991	1901-51	1951-71	1971-91
1	Andhra Pradesh	19,066	31,115	43,503	66,508	0.98	1.68	2.12
2	Aruna. Pradesh	NA	NA	468	865	NA	NA	3.07
3	Assam	3,290	8,029	14,625	22,414	1.78	3.00	2.13
4	Bihar	27,311	38,782	50,719	75,021	0.70	1.34	1.96
5	Goa	476	547	795	1,170	0.28	1.87	1.93
6	Gujarat	9,094	16,263	26,697	41,310	1.16	2.48	2.18
7	Haryana	4,623	5,674	10,036	16,464	0.41	2.85	2.47
8	Himac. Pradesh	1,920	2,386	3,460	5,171	0.43	1.86	2.01
9	Jammu-Kashmir*	2,139	3,254	4,616	7,719	0.84	1.75	2.57
10	Karnataka	13,055	19,402	29,299	44,977	0.79	2.06	2.14
11	Kerala	6,396	13,549	21,347	29,099	1.50	2.27	1.55
12	Madhya Pradesh	16,861	26,071	41,654	66,181	0.87	2.34	2.31
13	Maharashtra	19,391	32,003	50,412	78,937	1.00	2.27	2.24
14	Manipur	284	578	1,073	1,837	1.42	3.09	2.69
15	Meghalaya	340	606	1,012	1,775	1.16	2.56	2.81
16	Mizoram	82	196	332	690	1.74	2.64	3.66
17	Nagaland	102	213	516	1,210	1.47	4.42	4.26
18	Orissa	10,302	14,646	21,945	31,660	0.70	2.02	1.83
19	Punjab	7,545	9,161	13,551	20,282	0.39	1.96	2.02
20	Rajasthan	10,294	15,971	25,766	44,006	0.88	2.39	2.68
21	Sikkim	59	138	210	406	1.70	2.10	3.30
22	Tamil Nadu	19,253	30,119	41,199	55,859	0.89	1.57	1.52
23	Tripura	173	639	1,556	2,757	2.61	4.45	2.86
24	Uttar Pradesh	48,628	63,220	88,342	139,112	0.52	1.67	2.27
25	West Bengal	16,940	26,300	44,312	68,078	0.88	2.61	2.15
UNION TERRITORIES								
26	And. Nicobar	25	31	115	281	0.43	6.55	4.47
27	Chandigarh	22	24	257	642	0.17	11.86	4.58
28	Dadra & Haveli	24	42	74	138	1.12	2.83	3.12
29	Daman & Diu	32	49	63	102	0.85	1.26	2.41
30	Delhi	406	1,744	4,066	9,421	2.92	4.23	4.20
31	Lakshadweep	14	21	32	52	0.81	2.11	2.43
32	Pondicherry	246	317	604	808	0.51	3.22	1.45
33	All India	238,396	361,088	548,160	846,303	0.83	2.09	2.17

* The 1991 census was not conducted in Jammu and Kashmir. Hence the population projected by the Standing Committee has been used.
Source: Registrar General, Paper-2 of 1992: Table 2, p. 86-97

It has been hypothesized on analytical and some empirical grounds, that in 1991 there might have been a greater underenumeration of females compared to males because of serious political disturbances in the Hindi-speaking states immediately before the census count (Srinivasan, 1991). Women's lower status in Indian society contributes to their low age at marriage, lower literacy, and higher fertility and mortality levels during the reproductive ages.

One possible explanation for the factors that contributed to women's lower status and the discriminatory treatment meted out to the girl child in the old civilizations, such in China, the Middle East, and India, comes from the prevailing understanding of the differential survival capabilities of the sexes. From centuries of observations on the mortality of male versus female, these civilizations may have realized that given equal nutrition and care, at every age, from conception onward, the male is the biologically weaker sex and needs relatively better treatment and attention for equalizing the chances of survival. One expects this to happen at the family level where the relatively weaker child gets better nutrition and attention than the others. To have a balanced sex ratio in the population, similar mechanisms seem to have operated at the societal level with regard to male children. However, over the centuries the additional care required for the male child became institutionalized by his having intrinsic social and religious value, not possessed by the female child, and preferential nutrition practices might have become institutionalized. Without such an explanation it is difficult to understand how the sex ratio in many of these countries became more unfavorable to females in recent decades than at earlier periods.

Recently the large metropolitan cities of Bombay, Calcutta, Delhi, and Madras have experienced increasing incidence of female feticide through the use of the modern techniques of sonography (ultrasonography) or amniocentesis. When these procedures determine that a fetus is female, it is more likely to be aborted. It is amazing that such modern techniques, primarily used in obstetrical practice to identify genetic abnormalities or fetal growth disorders, could also be used in a specific cultural context to perpetuate biases and prejudices against the female almost from the moment of conception. The government has recently legislated against the use of these techniques for identifying the sex of the unborn child as a prelude to induced abortion. The effects of such practices on the sex ratio can be expected to be significant.

Age Structure

India's population continues to remain young, with about 38 percent of the total being children below age 15, practically unchanged since the beginning of this century (Tables 4.3 and 4.4). Because of the persistence of high fertility and declines in child mortality in recent decades, there are only small changes in this proportion, although since 1971 there has been

a declining trend. For example, in 1971 the percentage below age 15 was estimated at 42 as observed from the smoothed age distribution; this was expected to have declined to 36.2 percent by 1991 and to dip to 29.4 percent by 2021, according to projections of the International Institute for Population Sciences (Srinivasan and Parsuraman, 1991). Among the larger states with over 20 million in 1981, this proportion varied from 34.9 in Kerala to 41.7 percent in Uttar Pradesh, reflecting mainly fertility differentials in these two states.

On the other hand, the proportion in older ages, 60+, continues to rise over the years because of declining mortality. In 1981 the proportion was computed to be 6.5 percent and is expected to increase to 9.3 percent by 2021. The dependency ratio in the population (the ratio of children under 15 and adults over 60 to the population aged 15-59) was estimated at 85.3 percent in 1981 and is expected to decline and rise again consistent with future fertility and mortality declines. In Kerala the proportion of population aged 65 and over, even in 1981, was 7.5 percent, substantially higher than the national average of 6.5 reflecting Kerala's higher life expectancy compared to the rest of the country.

Mortality

Life expectancy in India has improved substantially from the beginning of the century (Table 4.1). Life expectancy at birth, estimated at 20 years in 1921, had climbed to nearly 60 by 1991. During the four decades 1941-51 to 1981-91, life expectancy rose by 25 years with about 0.6 years added to an Indian's life each year. Credit for this considerable achievement goes to various public health measures undertaken by the central and state governments. Life expectancy varies considerably among the states. For the quinquennium 1986-91 life expectancy is estimated at 71.1 years in Kerala but 49.6 years in Uttar Pradesh.

The crude death rate has declined from 47.2 fatalities per thousand population during 1911-21 to 9.6 in 1990. The decline in the death rate seems to have begun after 1921, and since 1951 has been quite rapid. Infant mortality rates (IMR; deaths of children below age one year per 1000 live births), as estimated by the census actuary were as high as 222 for the decade 1901-11 and have steadily declined to 129 for 1961-71 (averaged at 1966). Six years of see-sawing rates (Table 4.5) preceded the final downhill slide in 1978. The overall 90-year decline is 142.

While there has generally been a declining trend in overall mortality levels as well as IMR, the pace has been faster in some states than in others, and more in urban than in rural areas of all states. For example, in 1990 the infant mortality rate ranged from 123 in Orissa to 17 in Kerala. In the rural areas of India, the rate was 86 compared to 51 in urban areas. These differentials can be largely attributed to the prevalence of better health and medical

Table 4.3 Trends in Dependency Ratios: India, 1881-1991

Year	Total Population (millions)	Percentage of Population in Ages			Dependency Ratio		
		0-14	15-59	60+	Young	Old Age	Total
1881	193.6	38.40	56.35	5.25	68.15	9.32	77.47
1891	233.3	38.82	55.95	5.23	69.38	9.24	78.62
1901	238.4	38.05	56.88	5.07	66.89	8.93	75.82
1911	252.1	37.84	56.92	5.24	66.48	9.21	75.69
1921	251.3	38.68	55.94	5.38	69.14	9.63	78.77
1931	279.0	38.50	56.09	5.11	68.27	9.06	77.33
1941	318.7	39.15	55.16	5.69	67.77	10.31	78.08
1951	361.1	38.42	56.09	5.49	68.49	9.80	78.29
1961	439.2	41.03	53.30	5.67	76.96	10.64	87.60
1971	548.2	42.02	51.99	5.99	80.82	11.51	92.33
1981	683.3	39.55	53.96	6.49	73.29	12.02	85.31
1991	846.3	36.18	57.25	6.57	63.20	11.49	74.69

Notes: Dependency ratios: Young = ages 1-14 divided by ages 15-59; old = 60+ divided by 15-59; total = 0-14 + 60+ divided by 15-59

Sources: 1881-51 figures from Mukherjee, 1976; 1961-81, figures from India, Registrar General, various years. For 1991, total population is from 1991 census figures; percentage in different age groups is from India, Planning Commission, 1989.

Table 4.4 Age-Sex Distribution of Projected Population in Percentages (Assumption II-- Reaching NRR of one by 2011): India, 1981-2021

Age Group	1981		1991		2001		2011		2021	
	M	F	M	F	M	F	M	F	M	F
0-4	12.28	12.85	13.23	13.28	11.31	11.39	9.16	9.16	8.35	8.29
5-9	14.03	14.13	12.17	12.18	10.87	10.94	9.51	9.50	7.93	7.89
10-14	13.16	12.65	10.66	10.84	10.49	10.49	9.59	9.59	8.07	8.03
15-19	9.89	9.37	10.63	10.67	10.00	9.97	9.38	9.38	8.47	8.43
20-24	8.43	8.82	9.77	9.44	8.90	8.92	9.06	9.01	8.55	8.52
25-29	7.49	7.77	8.14	7.88	8.85	8.77	8.62	8.54	8.36	8.32
30-34	6.27	6.47	6.72	6.76	8.07	7.72	7.65	7.63	8.06	7.98
35-39	5.79	5.90	5.77	5.95	6.72	6.43	7.59	7.49	7.65	7.55
40-44	5.24	5.03	4.99	5.12	5.51	5.47	6.88	6.56	6.76	6.72
45-49	4.47	4.31	4.37	4.42	4.65	4.76	5.66	5.41	6.63	6.55
50-54	4.01	3.61	3.81	3.77	3.91	4.05	4.55	4.55	5.91	5.67
55-59	2.47	2.46	3.19	3.09	3.29	3.39	3.70	3.86	4.71	4.59
60-64	2.73	2.73	2.44	2.36	2.69	2.75	2.94	3.14	3.60	3.71
65-69	1.39	1.47	1.74	1.75	2.05	2.08	2.27	2.45	2.71	2.96
70+	2.28	2.38	2.37	2.49	2.72	2.88	3.45	3.72	4.24	4.80
Population in millions	343.9	321.4	437.8	406.5	524.2	490.3	602.7	567.3	672.1	636.2

Notes: 1981 figures exclude Assam. Columns sum to 100.

Source: Adapted from Srinivasan, 1992, Table 11. Projections for 1991-2021 based on 1981 census by International Institute for Population Sciences, Bombay (Srinivasan et al., 1992)

Table 4.5 Fertility and Mortality Trends: India, 1971-90

Census Year	CBR			TFR			CDR			IMR		
	R	U	C	R	U	C	R	U	C	R	U	C
1971	38.9	30.1	36.9	5.4	4.1	5.2	16.4	9.7	14.9	138	82	129
1972	38.4	30.5	36.6	5.4	4.3	5.2	18.9	10.3	16.9	150	85	139
1973	35.9	28.9	34.6	5.2	3.7	4.9	17.0	9.6	15.5	143	89	134
1974	35.9	28.4	34.5	5.2	3.7	4.9	15.9	9.2	14.5	136	74	126
1975	36.7	28.5	35.2	5.2	3.7	4.9	17.3	10.2	15.9	151	84	140
1976	35.8	28.4	34.4	4.6	3.6	4.4	16.3	9.5	15.0	139	80	129
1977	34.3	27.8	33.0	4.3	3.3	4.1	16.0	9.4	14.7	140	81	130
1978	34.7	27.8	33.3	4.6	3.3	4.4	15.3	9.4	14.2	137	74	127
1979	35.1	27.6	33.7	4.7	3.4	4.4	14.1	8.1	13.0	130	72	120
1980	35.1	27.8	33.7	4.7	3.4	4.4	13.7	7.9	12.6	124	65	114
1981	35.6	27.0	33.9	4.8	3.3	4.5	13.7	7.8	12.5	119	62	110
1982	35.5	27.6	33.8	4.9	3.4	4.5	13.1	7.4	11.9	114	65	105
1983	35.3	28.3	33.7	4.9	3.4	4.5	13.1	7.0	11.9	114	66	105
1984	35.3	29.4	33.9	4.8	3.5	4.5	13.8	8.6	12.6	113	66	104
1985	34.3	28.1	32.9	4.6	3.3	4.3	13.0	7.8	11.8	107	59	97
1986	34.2	27.1	32.6	4.5	3.1	4.2	12.2	7.6	11.1	105	62	96
1987	33.7	27.4	32.2	4.4	3.2	4.1	12.0	7.4	10.9	104	61	95
1988	33.1	26.3	31.5	4.3	3.1	4.0	12.0	7.7	11.0	102	62	94
1989	32.0	25.0	30.5	NA	NA	NA	11.1	7.1	10.2	98	58	91
1990	31.5	24.4	29.9	NA	NA	NA	10.4	6.7	9.6	86	51	80

Notes: CBR = crude birth rate; CDR = crude death rate; IMR = infant mortality rate; TFR = total fertility rate; R = rural; U = urban; C = rural and urban combined; NA = not available. The half-yearly July-December 1973 survey was postponed and combined with the January-June 1974 survey and supervision work was also suspended. This might have affected 1973 and 1974 estimates. The aggregate estimate of birth rates excluded Bihar and West Bengal for 1970-78 and IMR excludes them for 1970-80.

Sources: Various publications of the Sample-Registration System by the Registrar General, India

care facilities in states such as Kerala, Maharashtra, Tamil Nadu, and West Bengal and to the relative concentration of these facilities in the urban areas in most states.

It has been observed that as Indian infant mortality levels decline, rural-urban differentials tend to narrow. For example, in Kerala in 1990 the rural IMR was estimated at 18 compared to 16 in urban areas while in Orissa the rural rate was 127 compared to 68 in urban areas. The reduced differentials in mortality between rural and urban areas seems to be an indicator of the extent of dispersion of basic health services across the country. Interestingly, in developed countries, in the 18th and 19th centuries, crude death and infant mortality rates were higher in urban areas than rural locales because of the greater poverty and lack of sanitation in cities. However, in India as in many other developing countries, the opposite is true, since urban areas have a higher density of medical and health care facilities than rural areas. The number of physicians and paramedics working in urban areas is disproportionately higher than in the rural areas.

Fertility

As discussed in the previous chapter, a unique characteristic of the Indian population is that natural fertility has been only moderately high and well below the levels observed in many developing countries. Levels were significantly lower than the possible biological maximum and observed in populations such as the Hutterites in Canada (Srinivasan, 1989). Despite early, universal marriage in India, social practices such as protracted periods of sexual abstinence for religious and cultural reasons, prolonged breastfeeding, and prohibition of widow remarriage in certain communities have contributed to significantly lower natural fertility among Indian women. For known periods of history, the average number of children born to Indian women has hardly exceeded six. Total fertility for various decades from 1901 estimated indirectly has rarely exceeded six, for any decade before 1951, when there was hardly any practice of modern contraception (Table 4.1).

India can take legitimate pride in having been the first country to launch an official program of family planning as a part of its First Five-Year Plan 1951-56. During successive plans, investments in the program have substantially increased and from 1951 to 1990, 55.5 billion rupees has been spent on the family planning program. The current pace of expenditure on the program is estimated at Rs. 8 billion per year or Rs. 50 per eligible couple. In spite of a substantial increase in investments in the program, fertility has declined only slowly since 1951, from a total fertility rate of 5.87 during 1951-61 to 4.20 around 1986. This 30-year decline of about 28 percent in total fertility is small compared to the large investments made and the emphasis on the two-child norm throughout the country.

Two major reasons can be attributed to this apparently tardy impact of the program. The first major reason is the undue emphasis given to permanent methods of family planning

(sterilization) in the program from its beginning which has reduced fertility only among older women after their desired family sizes have been achieved. The second major factor is that many of the traditional checks on fertility such as prolonged sexual abstinence for religious or social reasons and taboos on widow remarriage, have been weakened by modernization, and marital fertility levels among younger women have been increasing since 1951. Marital fertility among women aged 15-29 rose almost by 20 percent between 1959 and 1972 (Srinivasan and Jejeebhoy, 1981), despite increased contraceptive practice and increased bridal age from about 13 to 18 years. The fertility-decreasing effects of sterilization among married women aged 30 and above have been almost neutralized by the increases in natural fertility among women under 30.

The 1990 crude birth rate has been estimated by the Sample Registration System at 29.9 births per thousand population. As with mortality, there are substantial rural-urban differentials in fertility: rural areas have higher fertility than urban areas. The 1990 rural crude birth rate was 31.5 and for the urban areas, 24.4. There are also significant interstate fertility differentials with Kerala and Goa having birth rates below 20 during 1990.

Kerala's birth rate is estimated at 19.0 for all areas and Goa's birth rate was 15.4 for rural areas and 15.9 for urban ones. Thus, as in the case of mortality, we find rural-urban differentials tending to narrow as fertility levels fall below 20.

Besides rural-urban differentials, more detailed analysis of fertility data in populations in rural and urban areas classified by various socioeconomic categories reveals significant differentials by religion, caste, maternal education, occupation of household head, age of brides, and per capita monthly incomes or household expenditure (India, Registrar General, 1979). For example, it has been observed in an all-India sample survey conducted by the Registrar General that in rural areas, in 1978, while illiterate women had a total fertility rate (TFR) of 4.74 children, women with more than ten years of schooling had a TFR of 2.48 children--48 percent lower fertility. A consistent fertility decline has accompanied increased education for females. Similarly, while illiterate urban women had, on average, 4.00 children, those with matric and above qualification had an average of 1.88 children--53 percent lower fertility. Also, while married women from households with a monthly expenditure of less than Rs. 50 (very poor) in rural areas had a total marital fertility rate (TMFR) of 6.05 children, households with a monthly expenditure of Rs. 101 or more had a TMFR of 3.49--42 percent lower marital fertility.

Comparing such differentials in specific states reveals that when overall fertility levels decline, differentials tend to narrow, as in Kerala, which has practically no socioeconomic differentials in fertility.

Recent yearly trends in fertility and mortality levels, as obtained from the Sample Registration System (Table 4.5) reveal that declines do not seem to occur at a uniform pace

but with a sudden jerky downward trend after years of plateauing. For example, India's crude birth rate seems to have been stagnating between 32-35 per thousand population per year from 1973 to 1985 and only since 1986 has there been a resumption of the decline. This appears to be true for rural and urban areas alike. A similar observation is valid for infant mortality rates, stagnant around 130 from 1971 to 1980 with a resumption of sustained decline thereafter. Thus, it appears that the impact of any public health or family planning program activities on fertility and mortality levels seems to occur after a lag of five to ten years.

Urbanization

A study of the process of urbanization in India since the beginning of this century reveals a steady increase in the size of its urban population, number of urban centers, and level of urbanization since 1911 and a rapid rise since 1951 (Table 4.6). From 1951 to 1991, the urban Indian population more than tripled from 62.4 to 217.2 million. The number of urban centers (town and urban agglomerations) swelled from 2,843 in 1951 to 3,768 in 1991. The proportion of population living in urban areas (level of urbanization) increased from 17.3 percent in 1951 to 25.7 percent in 1991 (corrected to 26.14 in the final totals of the 1991 Census). The annual rate of growth of the urban population during 1981-91 was 3.09 percent, slightly less than in the previous two decades, 1971-81 (3.83 percent) and 1961-71 (3.21 percent). Thus it appears that the pace of increase in the urban population has been slowing in the recent years.

Towns are classified into six population size classes by the census as follows:

- Class I: population of 100,000 or more
- Class II: population between 50,000-99,999
- Class III: population between 20,000-49,999
- Class IV: population between 10,000-19,999
- Class V: population between 5,000-9,999
- Class VI: population below 5,000

Table 4.7 furnishes details on the urban population in different class towns based on the 1991 census and compared with earlier censuses. The lion's share of urban increase in population since 1981 has been in Class I towns. The proportion of the Indian urban population living in Class I towns is steadily growing toward two-thirds of the total. The two small size classes have experienced a net loss of population during the decade 1981-91. In 1981, India had 12 million-plus cities with a total population of 42.1 million and accounting for 6.2 percent of the country's population. By 1991, the number of million-plus

Table 4.6 Urbanization Trends: India, 1901-2021

Census Year	Population		Urban as Percentage of Total
	Total	Urban	
1901	238,396,327	25,851,873	10.84
1911	252,093,390	25,941,633	10.29
1921	251,321,213	28,086,167	11.18
1931	278,977,238	33,455,989	11.99
1941	318,660,580	44,153,297	13.86
1951	361,088,090	62,443,709	17.29
1961	439,234,771	78,936,603	17.97
1971	548,159,652	109,113,977	19.91
1981	683,329,097	159,462,547	23.34
1991	844,324,222	217,177,625	25.72
2001	1,032,452,000	341,330,000	33.06
2011	1,185,606,000	453,850,000	38.28
2021	1,328,337,000	577,830,000	43.76

Note: Actual census figures 1901-91; projections based on final totals of the 1981 Census and preliminary Census figures for 1991, including projected figures for Jammu-Kashmir where the census was not conducted.

Sources: Adapted from Srinivasan, 1992, Table 5; India, Registrar General, 1991a; projections by India, Planning Commission, 1989

cities had nearly doubled to 23, with a total population of 70.7 million and 8.4 percent of the Indian population. Thus the urbanization process in India has essentially been the growth of large towns and metropolitan cities at the cost of smaller towns and urban centers. While the pace of urbanization in the country as a whole has been slowing down, the pace of metropolitanism has been accelerating.

TRENDS AND DETERMINANTS IN MORTALITY PATTERNS

Currently the Indian population is going through a transition in which the historically prevalent high mortality rates among children are declining rapidly. The declines are largely attributable to the control of various infectious and communicable diseases that had been taking heavy tolls among children. Concomitantly, there is a tendency for mortality rates among adults and the elderly to increase because of increases in noncommunicable diseases including cardiovascular problems, cancer, and accidents. The shift from the age pattern of deaths from younger to older ages and from predominantly infectious to noninfectious causes because of modernization and public health programs has been termed the epidemiological transition (Omran, 1975).

Data on major causes of death in rural India from the Survey on Cause of Death conducted in sample areas by the Registrar General under the model registration scheme show that deaths from accidents and injury doubled over 28 years (Table 4.8). Deaths from circulatory system diseases increased less substantially while deaths from "fever," including malaria, and "disorders of respiratory system," including tuberculosis, declined dramatically by 20.3 percentage points since 1961. Deaths attributed to "senility," which includes heart attacks, have risen steadily. Thus, we see a shift in the causal pattern of deaths from infectious diseases to noninfectious ones, accidents, and injury. Deaths from childbirth and pregnancy have declined only marginally. Causes of death obtained in the model registration system are not based on autopsy reports or medical certification of cause of death but are the most likely inferred causes based on questionnaires administered by paramedical personnel on the prominent symptoms revealed by the deceased prior to death.

Data on changes in the percentage distribution of deaths by age during 1961-89 drawn from the sample registration system of the Registrar General are revealing (Table 4.8). While almost half of all 1971 deaths were among children age four and under, this proportion had declined to two-fifths by 1986. On the other hand, from age 40 onward, in every five-year age group, there has been a systematic rise in the proportion of deaths between 1971 to 1986. Thus, India's population is currently undergoing a rapid epidemiological transition with shifts in the major causes of death from infectious to

Table 4.7 Increase/Decrease of Urban Population in Each Size Class: India, 1981-91

Size Class of Towns	1991 Population in thousands	Population Increase/Decrease 1981-91		Contribution to Total Urban Population		Decadal Population Growth Rate	
		Absolute (000s)	Percentage	1981	1991	1971-81	1981-91
I-VI	212867	56447	100.00	100.00	100.00	46.23	36.09
I	138803	44298	+78.48	60.42	65.20	54.35	46.87
II	23309	5119	+9.07	11.63	10.95	55.73	28.14
III	28079	5670	+10.04	14.33	13.19	30.85	25.30
IV	16531	1600	+2.84	9.54	7.77	27.54	10.72
V	5531	-70	-0.13	3.58	2.60	17.82	-1.27
VI	613	-170	-0.30	0.50	0.29	65.73	-21.70

Note: Excludes Assam and Jammu, Kashmir

Source: Various publications of the 1981 and 1991 Census of India

Table 4.8 Trends in Distribution of Deaths by Causes: Rural India, 1961-89

Major Cause Groups (Prominent Symptom)	1961	1971			1976			1981			1986			1989		
	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C
Accident & injury	3.7	4.9	3.5	4.2	5.5	4.0	5.1	5.8	4.1	5.0	7.7	6.0	7.0	8.2	6.4	7.4
Childbirth & pregnancy	1.5	—	2.6	1.2	—	2.5	1.1	—	2.2	1.0	—	2.1	1.0	—	2.1	0.9
Fever	21.4	17.0	18.3	17.6	11.2	13.0	12.0	7.8	9.2	8.4	9.9	11.0	10.4	6.9	8.2	7.4
Digestive disorders	11.1	7.5	8.4	7.9	10.2	8.7	9.9	7.5	8.7	8.0	7.7	7.7	7.7	6.3	6.9	6.6
Cough & respiratory system disorder	26.5	23.3	21.1	22.3	23.0	18.3	20.9	22.8	18.2	20.7	21.5	17.6	19.7	21.7	18.3	20.2
Central nervous system disorder	NA	NA	NA	NA	3.5	3.7	3.6	3.6	3.2	3.5	3.6	3.9	3.7	4.9	4.6	4.8
Circulatory system diseases	7.4	9.0	8.7	8.8	8.8	8.1	8.5	9.8	7.7	8.8	9.6	8.3	9.0	11.8	9.8	10.9
Other clear symptoms	4.8	6.7	4.9	5.9	8.5	7.8	8.2	8.3	7.9	8.1	8.4	8.8	8.6	8.4	8.0	8.2
Causes peculiar to infancy	9.6	10.8	10.9	10.9	12.4	12.5	12.5	12.3	12.0	12.1	10.8	10.2	10.5	9.8	9.8	9.8
Senility	14.0	12.6	13.7	12.3	16.2	18.0	17.0	20.2	25.0	22.4	20.8	24.4	22.4	22.1	26.0	23.8
All other causes	NA	8.2	8.5	8.4	1.7	2.2	1.9	1.9	1.8	1.9	NA	NA	NA	NA	NA	NA
Total reported	16400	7754	9070	16824	8032	6667	14699	9462	7932	17394	10075	8187	18262	11915	9494	21409

Notes: M = male; F = female; C = male and female combined; separate data by gender not available for 1961. NA = not available. Columns sum to 100 percent.

Source: Registrar General India, "Survey of Causes of Death (Rural)," annual reports for various years

noninfectious diseases and in the age pattern of mortality with death rates in the younger group declining and increasing in the older group.

Data in Table 4.10 on the number of cases of selected infectious diseases reported and deaths due to them and fatality rates per 1000 cases in different quinquennia from 1971 are based on those compiled by the Central Bureau of Health Intelligence and reported by district health offices. The reported incidence of tuberculosis in 1981-85 and 1986 computed yearly was substantially higher than the number of cases reported earlier. However, the case fatality rate for the disease seems to have declined between 1976-80 and 1981-85 by almost half, probably because of early detection and administration of modern methods of chemotherapy.

Table 4.11 presents data on infant mortality rates since 1970 subdivided by neonatal (within four weeks of birth) and postneonatal mortality rates (four weeks to one year). From 1970 to 1988, the total infant mortality rate declined by 46 points from its 1975 peak, by 49 in rural areas and by 28 in urban areas. The decline has been more rapid in postneonatal than in neonatal mortality rates; while the former fell from 61 in 1970 to only 38 in 1988, neonatal mortality dropped only from 69 to 57. The decline in postnatal mortality rates even in rural areas has been substantial, from 64 in 1970 to 40 in 1988. On the other hand, the decline in rural neonatal mortality has been very tardy. The need to reduce neonatal mortality in India is urgent. Rates remain quite high, possibly because of poor antenatal care and unskilled attention at the time of delivery.

A number of studies carried out across India involve data collection through household surveys with a view to identifying specific areas of antenatal and postnatal health intervention and the household socioeconomic and environmental factors that influence neonatal and postnatal mortality levels. A summary of findings from nine such studies conducted in India during the past 15 years on different factors considered to be determinants of neonatal, postnatal, and infant mortality rates and their statistical significance appears in Tables 4.12 and 4.13 (Jain and Visaria, 1988). The determinants are grouped under seven sets of factors: antenatal care, care at birth, postnatal care, maternal factors, socioeconomic factors, environment, and others; one or more sets are found to be associated with infant survival in all studies. The significant factors for neonatal mortality seem to be immunizing pregnant women against tetanus, skilled attention at the time of delivery, and prenatal nutritional supplementation. With regard to postnatal mortality, immunization against common, preventable, communicable diseases; environmental factors; and family socioeconomic conditions, especially maternal education, influence the rates.

Table 4.9 Percentage Distribution of Deaths by Age and Sex: India, 1971-86

Age Group	1971			1976			1981			1986		
	M	F	T	M	F	T	M	F	T	M	F	P
0-4	45.24	50.83	48.07	44.15	51.99	47.49	38.00	43.21	40.50	36.80	42.70	39.66
5-9	4.45	4.60	4.52	4.02	5.11	4.53	4.10	4.83	4.46	3.52	4.50	3.99
10-14	1.80	1.60	1.70	1.94	2.03	1.98	1.87	1.76	1.77	1.71	1.74	1.72
15-19	1.52	1.58	1.35	1.40	1.62	1.50	1.48	2.18	1.82	1.71	2.18	1.94
20-24	1.52	2.19	1.85	1.29	2.22	1.73	1.60	2.60	2.09	1.75	2.74	2.23
25-29	1.43	2.08	1.75	1.40	2.37	1.85	1.48	2.41	1.93	1.68	2.28	1.97
30-34	1.67	2.19	1.93	1.70	2.16	1.92	1.83	2.11	1.87	1.63	1.95	1.78
35-39	2.22	2.21	2.22	1.72	1.97	1.83	2.10	1.97	2.04	2.35	1.93	2.15
40-44	2.61	1.87	2.24	3.17	1.56	2.42	2.69	2.03	2.37	2.76	2.12	2.46
45-49	3.07	2.09	2.58	3.34	2.10	2.76	3.35	2.51	2.94	3.71	2.16	2.96
50-54	4.95	3.18	4.07	4.80	2.98	3.95	4.85	3.06	3.98	5.20	3.11	4.19
55-59	3.97	2.46	3.22	4.36	2.77	3.62	4.64	3.25	3.96	4.38	3.18	3.80
60-64	6.49	5.32	5.91	7.80	5.53	6.74	7.82	6.28	7.07	8.25	6.50	7.40
65-69	54.59	3.40	4.00	4.64	3.92	4.30	5.69	4.71	5.21	5.73	5.12	5.43
70+	14.87	14.29	14.58	14.59	12.00	13.38	18.48	17.15	17.83	18.83	17.76	18.32
N (thousands)	4266	4235	3501	5187	4565	9189	4355	4136	8492	4588	4299	8432

Note: M = male; F = female; T = males plus females. Total may not tally due to rounding.

Source: India, Registrar General, Sample-Registration System, 1970-75, 1976-78, 1981, 1986; Registrar General India, Census of India 1971 and 1981, Series-1 Part II C(ii), Social and Cultural Tables, C1 to C4

Table 4.10 Reported Cases, Deaths, and Case Fatality Rates (per 1000) from Leading Communicable Diseases: India, 1971-86

Causes	1971-75 (5 years)			1976-80 (5 years)			1981-85 (5 years)			1986 (1 year)			1971-86 (combined)		
	C	D	CFR	C	D	CFR	C	D	CFR	C	D	CFR	C	D	CFR
Chicken pox	292079	208	.71	354890	319	0.90	218806	213	1.06	40788	40	.98	906563	798	.88
Diphtheria	98401	2597	26.39	98925	1761	17.80	73828	2159	29.24	6734	384	57.02	277888	6901	24.83
Polio	36794	723	19.65	57283	1127	19.67	108986	2358	21.64	16550	535	32.33	219613	4743	21.60
Measles	385569	803	2.08	638162	2009	3.15	815226	1889	2.32	140827	353	2.51	1979784	5054	2.55
Tetanus	205943	18949	92.01	195812	29430	150.30	175723	29300	166.74	29996	4655	155.19	607474	82334	135.54
Whooping cough	1039613	992	0.94	1139871	1363	1.20	1222075	559	0.46	167255	68	0.41	3568814	2982	0.84
Dysentery	20088428	10929	0.54	28145318	9716	0.35	43237583	13936	0.32	8208268	1707	0.21	99679597	36288	.36
Gastroenteritis	4322615	17493	4.05	4181836	24219	5.79	6060107	27249	4.50	1303688	4068	3.12	15868246	73029	4.60
TB	2059665	30547	14.83	2048319	45637	22.28	4381049	50866	11.61	853202	9425	11.05	9342235	136475	14.61

Notes: C = cases; D = deaths; CFR = case fatality rate [(D/C) * 1000]

Source: India, Directorate General of Health and Family Welfare, 1989

Table 4.11 Neonatal, Postneonatal, and Infant Mortality Rates: India, 1970-88

Year	Neonatal Mortality Rate			Postneonatal Rate			Infant Mortality Rate		
	R	U	C	R	U	C	R	U	C
1970	72.3	46.0	68.5	63.6	44.5	60.9	136.0	90.0	129.0
1971	80.6	45.4	75.2	57.4	36.6	54.2	138.0	82.0	128.0
1972	76.6	44.9	71.6	73.4	40.1	68.2	150.0	85.0	139.0
1973	72.1	47.5	68.2	70.8	41.4	66.2	143.0	89.0	134.0
1974	75.7	41.0	70.1	60.2	32.9	55.8	136.0	74.0	126.0
1975	84.3	46.2	78.3	66.7	37.8	62.1	151.0	84.0	140.0
1976	83.0	49.0	77.0	56.0	31.0	52.0	139.0	80.0	129.0
1977	88.0	42.0	80.2	52.0	39.0	49.8	140.0	81.0	130.0
1978	85.2	38.0	77.4	51.8	36.0	49.6	137.0	74.0	127.0
1979	77.7	42.4	71.7	52.0	29.8	48.3	129.7	72.2	120.0
1980	75.5	39.1	69.3	48.3	26.1	44.6	123.8	65.2	113.9
1981	75.6	38.5	69.9	43.5	24.0	40.5	119.1	62.5	110.4
1982	72.9	38.8	66.7	40.8	26.4	38.1	113.7	65.5	104.8
1983	73.6	34.3	67.2	40.2	26.5	37.7	113.8	65.8	104.9
1984	72.2	39.7	65.8	41.1	26.4	38.2	113.3	66.1	104.0
1985	66.6	33.3	60.1	39.9	25.6	37.1	106.5	58.9	97.2
1986	65.5	36.2	59.8	39.7	25.8	36.6	104.6	62.0	96.4
1987	63.6	33.3	57.7	40.5	27.3	37.7	104.0	61.0	95.0
1988	62.0	34.6	56.8	40.1	27.5	37.7	102.0	62.0	94.0

Notes: R = rural; U = urban; C = rural and urban combined

Source: Registrar General of India, Sample Registration System data

The various studies carried out in India and abroad do not all agree on the relative importance of different public health intervention programs vis-à-vis socioeconomic variables in reducing neonatal and postnatal mortality. All studies seem to agree that there is a strong interaction between maternal education and health infrastructure variables in reducing neonatal and postnatal mortality. Not all studies have used all seven sets of factors considered as infant mortality determinants. Even among the factors considered in each study, not many turned out to be statistically significant. The significant factors noticed in any one of the studies in relation to neonatal mortality are place of delivery, care at birth, type of birth attendant; for postnatal mortality, the significant factor is birth order. For infant mortality rates as a whole, significant factors are maternal age and education, antenatal care, supplemental feeding and immunization of children, birth order, household income and expenditure.

COMPARISON OF OTHER STATES WITH CONDITIONS IN KERALA: TIME LAGS IN DEVELOPMENT

Kerala State presents a unique demographic scenario in relation to all other states in India. As of 1990 it had achieved a crude birth rate (CBR) of 19.0, crude death rate (CDR) of 5.9, and infant mortality rate (IMR) of 17--levels comparable to the fertility and mortality conditions prevailing in many developed countries. Kerala surpassed, in 1989, India's targets for a CBR of 21, a CDR of 9, and IMR of 60 to be realized by 2001. The uniqueness of Kerala's demographic transition is that it has reduced fertility and mortality under conditions of quite a low per capita income (lower than national average) and industrialization. The only other state to achieve similar low fertility and mortality is Goa, but the factors underlying its demographic transition are different from Kerala's, with a high proportion of Goa residents working in the nonagricultural sector and a much higher per capita income than in Kerala. Goa was a Portuguese colony until the early 1960s.

All other states in India lag behind Kerala in all demographic parameters. The extent to which they lag behind can be measured by the interval between the year Kerala realized a particular value of a demographic parameter currently experienced by a particular state, and the current year. Andhra Pradesh had a 1988 CBR of 26.8, a level Kerala reached in 1976, so Andhra Pradesh lags behind Kerala by 12 years in CBR. Similarly the lag period for various other parameters such as CDR, IMR, total fertility rate, mean age at marriage for males and females, neonatal and postnatal mortality rates, and percentage of deaths at ages zero to four to total deaths has been computed (Table 4.14) for 14 large states and India as a whole, with recent values of the parameters in Kerala.

Table 4.12 Antenatal and Maternal Factors Affecting Infant Mortality and Its Components, India, 1971-84

Factors	Rural Maharashtra, 1984-- Rao & Coyaji		Rural & Urban Uttar Pradesh, 1981-83-- Khan			Madurai District, Tamil Nadu, 1979-82-- Gunasekaran			34 Villages, Tamil Nadu, 1971-75-- Ramanujam			Rural Gujarat, 1979-80-- Gandotra & Das			Rajasthan, 1981, & Orissa, 1982 --Kanitkar & Murthy			Rural Madhya Pradesh, 1983-- Taiwar
	N	IM	N	PN	IM	N	PN	IM	N	PN	IM	N	PN	IM	N	PN	IM	IM
Antenatal Care																		
Tetanus	N																	NS
Other					X	S	NS	S	X	X	X		X	X				S
Care during Delivery																		
Safe Kit	S																	
Place of Delivery		NS				S	NS	NS							N	NS	NS	NS
Birth Attendant	N	NS	X	X	X	S	NS	NS	X	X	X				N	NS	NS	NS
Postnatal Care													X					
Supplemental Feeding						N	X	S										
Immunization						N	X	S										
Maternal Factors																		
Age		S	X	X	X	N	NS	NS	X	X	X	N	NS		N	NS	NS	S
Birth Order		NS	X	X	X	N	S	S	X	X	X	N	NS		N	NS	NS	X
Birth Interval			X	X	X				X	X	X		X					S

Notes: N = neonatal mortality; PN = postneonatal mortality; IM = infant mortality; NS = not significant; NA = not applicable; X = statistical significance not tested. Information in this table relates to material authors of seven chapters in Jain and Viaria, 1988, considered in assessing effects on infant mortality and its components; authors used primary data from the regions indicated.

Source: Based on Jain and Visaria, 1988, chapters 6-12, adapted from Table 1.1

Table 4.13 Socioeconomic, Environmental, and Other Factors Affecting Infant Mortality and Its Components, India, 1971-84

Factors	Rural Maharashtra, 1984--Rao & Coyaji		Rural & Urban Uttar Pradesh, 1981-83--Khan			Madurai District, Tamil Nadu, 1979-82--Gunasekaran			34 Villages, Tamil Nadu, 1971-75--Ramanujam			Rural Gujarat, 1979-80--Gandotra & Das			Rajasthan, 1981 & Orissa, 1982--Kanitkar & Murthy			Rural Madhya Pradesh, 1983--Talwar	
	PN	IM	N	PN	IM	N	PN	IM	N	PN	IM	N	PN	IM	N	PN	IM	PN	IM
Socioeconomic Factors																			
Education--Male			X	X	X	N	NS	NS	X	X	X	N	NS		N	NS	NS		
Education--Female						N	NS	NS	X	X	X					NS	NS		
Occupation														NS	N	NS	NS	X	
Income/Expenditures						X	NS	S	X	X	X								
Socioeconomic Status Index												N	NS		N	NS	NS		
Environment																			
Water			X	X	X	N	NS	NS							N	NS	NS		
Sanitation						N	NS	NS							N	NS	NS		
Housing			X	X	X	N	NS	NS	X	X	X	N	NS		N	NS	NS		
Other																			
Sex of Child									X	X	X	N	NS		N	NS	NS		NS
Cause of Death	X	X					X	X				X	X	X					X
Community							X	X											

Notes: N = neonatal mortality; PN = postneonatal mortality; IM = infant mortality; NS = not significant; NA = not applicable; X = statistical significance not tested. See also Table 4.12.

Source: Based on Jain and Visaria, 1988, chapters 6-12, adapted from Table 1.1

Table 4.14 Time Lag (in years) of Other States from Kerala in Selected Demographic and Health Parameters: India, 1988

States	Demographic Variables (lag period in years from Kerala)								
	CBR	CDR	IMR	TFR	Mean Age at Marriage		Mortality		Deaths of Children 0-4 of Total Deaths (%)
					Male	Female	Neonatal	Postnatal	
Andhra Pradesh	12	16	28	25	>80	>80	>25	>20	>20
Assam	20	22	32	30	NA	NA	>25	>20	>20
Bihar	22	25	33	>50	>80	>25	>25	>20	>20
Gujarat	16	18	28	18	>80	40	>25	>20	>20
Haryana	20	16	28	30	>80	50	>25	>20	>20
Karnataka	15	14	23	14	30	40	>25	19	>20
Madhya Pradesh	22	28	37	30	>80	>80	>25	>20	>20
Maharashtra	16	16	28	14	60	50	>25	>20	>20
Orissa	19	22	38	28	60	40	>25	19	>20
Punjab	15	16	18	14	60	10	22	>20	>20
Rajasthan	20	28	28	>50	>80	>80	>25	>20	>20
Tamil Nadu	3	14	22	12	20	10	>25	19	18
Uttar Pradesh	22	25	38	>50	>80	50	>25	>20	>20
West Bengal	15	16	28	14	30	40	>25	>20	>20
India	18	20	28	28	50	50	>25	>20	>20
Kerala (base values)	20.3	6.4	28	2.3	27.2	21.8	18.0	9.7	12.66

Note: Base year for all variables is 1988 with the exception of mean age at marriage, for which the base year is 1981.

Sources: Adapted from Srinivasan, 1992, Table 19; India, Registrar General, Sample Registration System; Sinha, 1987, Table 6.4

Kerala has had a higher marriage age than other states for a historically long time. Even in 1911 Kerala's age at marriage was higher than that found in 1981 in Andhra Pradesh, Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh. Kerala's long tradition of relatively higher age at marriage for girls compared to the rest of the country is rooted in its unique cultural history which provided females a higher status. Similarly, with such mortality parameters as CDR and IMR, the lag periods vary between 14 to 38 years. While Tamil Nadu and Karnataka lag behind Kerala by 14 years in CDR values, Uttar Pradesh, Bihar, Rajasthan, and Madhya Pradesh lag by 30 years or more. The lag in neonatal rates is more than for postnatal mortality rates. With regard to CBR, Tamil Nadu lags behind Kerala by only 3 years while all other states fall behind by 12 to 22 years. Thus we see a unique situation in India where the demographic and health conditions in Kerala are far better than in the rest of the states. Whether Kerala's experiences in achieving this demographic transition could be used in expediting the transition elsewhere deserves attention by all concerned with health and family planning in India.

INDIA'S DEVELOPMENT IN COMPARISON WITH OTHER LARGE DEVELOPING COUNTRIES

Agricultural production in India still depends on the vagaries of nature, especially rainfall during the monsoon. However, thanks to the "green revolution," there have been substantial improvements in agricultural production since independence, especially after the launching of five year plans in 1951. Since the mid-seventies, India has been self-sufficient in its aggregate food requirements and there is enough food stock to overcome the unexpected demands that one or two years of severe draught might cause .

Total production of food grains, including cereals and pulses, increased almost threefold from about 51 million tons in 1950-51 to 152 million in 1983-84 but declined to 140 million tons in 1987-88. Since 1987 there has been a steady increase and agriculture production stood at 171 million tons in 1989-90. The annual figures show considerable fluctuation, revealing the dependence of Indian agriculture on the vagaries of weather. The average annual geometric growth rate in food production from 1951 to 1990 was 2.8 percent. If we analyze cereal and pulse production separately for 1950-90, we find that while cereal production increased by 3.1 percent per year, pulses grew by only 0.2 percent per year. In per capita production, there was a decline for pulses--the main source of protein in 1950-90. Nonfood grain production, such as cotton and oil seeds, has also shown a rising trend, similar to food grains over the years. The index of production of all crops, food grains, and nonfood grains, was estimated at 158 in 1985-86, 153 in 1986-87, 151 in 1987-88, and 186 in 1989-90 using 1969-70 production as the base value of 100.

Though this is substantial compared to India's preindependence production figure, per capita food grain production has increased very little over the years because of population growth of over 2.1 percent per annum. Compared with an annual increase of 2.8 percent in total food production during 1950-90, because of population growth, the per capita increase is only 0.7 percent per year. While per capita cereal production increased by 1.0 percent, per capita production of pulses declined by 1.9 percent. Actually the per capita availability of all food grains (cereal and noncereal) for 1979-80 and 1986-87 declined to 1600 g from 2000 g in 1977-78, because of serious drought during these periods. The percentage share of agricultural production in the gross domestic product (GDP) has consistently declined over the years from 49.5 percent in 1950-51 to 27.8 percent in 1987-88 indicating a sharper pace of increase in industrial production. (See Appendix C for details.)

For a comparative picture of development in India with other developing countries, data were compiled for 11 other large developing countries all with a population of 50 million or more in 1980 (Table 4.15). India is the second most densely populated country among these 12 nations, with 258 persons per square kilometer in 1990, according to The World Bank; 274 in 1991 per the Census, next after Bangladesh with 769 persons per square kilometer. India has a very low level of per capita income of US \$340 and per capita annual income derived from agriculture is only US \$102. In both these aspects, India is the second poorest country among the 12 large developing countries. China, immediately above India, and Indonesia, immediately below India in population in 1989, have per capita income and per capita agriculturally derived income higher than India's.

During 1965-80, the annual increase in the gross domestic product (GDP) was also the lowest but one in India of the 12 countries estimated. During that period, China had an annual increase of 6.8 percent in GDP, and Indonesia a 7.0 percent increase (mainly attributable to off-shore exploration of large deposits of petroleum), compared to 3.6 percent in India. From 1980 to 1990 India's GDP increased by 5.3 percent per annum and ranked sixth among the 12 countries. In fertilizer consumption per hectare of land during 1989-90, India ranks seventh with 68.7 kilograms of nutrient used compared with 261.9 in China and 116.6 in Indonesia. Thus, while we see an acceleration in the pace of the Indian economy as a whole since 1980 and agricultural production in particular, India still ranks tenth among the 12 in per capita GDP as of 1990.

Industrial Production

Trends in industrial production in India since independence have been more impressive than in the agricultural sector. The pace of industrial development, especially in producing iron ore, steel, cement, machine tools, and generating electricity, has been striking. For

Table 4.15 Macrolevel Economic Indicators: India and 11 Large Developing Countries, 1965-90

Country	Population (millions)	Density (population per km ²)	Average Annual Growth Rate of GDP (%)		GNP per Capita (US\$)	GDP (millions US\$)		Distribution of GDP (% in Agriculture)		Fertilizer Consumption	
	Mid-1990	1990	1965-80	1980-90	1990	1965	1990	1965	1990	1970-71	1989-90
China	1133.7	119	6.8	9.5	370	67200	364900	38	27	410	2619
India	849.5	258	3.6	5.3	350	50530	254540	44	31	137	687
Indonesia	178.2	94	7.0	5.5	570	5980	107290	51	22	133	1166
Brazil	150.4	18	9.0	2.7	2680	19470	414060	19	10	186	430
Bangladesh	106.4	741	1.7	4.3	210	4380	22880	53	38	157	993
Nigeria	115.5	125	6.0	1.4	290	5380	34760	55	36	2	121
Pakistan	112.4	141	5.2	6.3	380	5450	35500	40	26	146	890
Mexico	86.2	44	6.5	1.0	2490	21640	237750	14	9	232	728
Philippines	61.5	205	5.7	0.9	730	6010	43860	26	22	287	674
Thailand	55.8	109	7.3	7.6	1420	4390	80170	32	12	59	365
Turkey	56.1	72	6.2	5.1	1630	7660	96500	34	18	157	645
Egypt	52.1	52	7.3	5.0	600	4550	33210	29	17	1312	4043

Note: Fertilizer consumption given as hundreds of grams of plant nutrient per hectare of arable land.

Sources: World Bank, 1992, Tables 1, 2, 3, 4

example, iron ore production soared from three million tons in 1950-51 to 51 million in 1989-90 (17 times); cement production from 2.7 million tons to 45.8 million tons (17 times); and electricity generated from 5.1 billion Kwh to 245.1 Kwh (48 times) in the same period. (See Appendix D for details.)

Taking 1970 as the base, the general index values of industrial production in 1990-91 is estimated at 306 compared to 186 for that year in agricultural production. This represents a threefold increase in industrial production in 20 years. The lowest increase in industrial production during this period is in textile machinery manufacturing (140), followed by food manufacturing (218), and paper products (244). The relatively lower progress in food manufacturing should be correlated with the relatively slow pace of agricultural production discussed earlier. Growth in industrial production does not also appear to be uniform for the entire period. The increase in the index value of industrial production during 1970-90 appears to be almost twice that in the agricultural sector.

In terms of three important criteria of industrialization--urbanization, percentage of the labor force employed in the industrial sector, and per capita GDP received from the nonagricultural sector, India ranks between eighth and eleventh among the 12 countries in 1989 (Table 4.16). The ranking has practically remained the same from 1965 to 1989.

Thus, in spite of significant improvement, especially during the past 20 years, India has not improved her relative position among the developing countries in either urbanization or industrial production. Though she has done much better in the industrial than the agricultural sector, there was little improvement compared with other developing countries. Similarly, although the share of 1990 per capita income derived from the nonagricultural sector was 69 percent--considered high, in relation to other countries, India ranks tenth among the 12. In actual income from this sector and per capita GDP, India was the next to last, with a per capita GDP of 240. Thus, one finds India in a situation of relatively very slow economic development in industry and agriculture, with a slightly better performance in industry.

Literacy and Education

India's performance in promoting literacy and improving educational levels of the population is the most disappointing. India's goal of universal primary education for all children between the ages of 5 and 14 years was even enshrined in the constitution as a guiding principle to be achieved before 1965. Comparing general literacy rates above age 5 in 12 large developing countries, India, with only 36 percent literate in 1981, stood ninth, only above Bangladesh, Pakistan, and Nigeria (Table 4.17).

Table 4.16 Comparison of Trends in Urbanization and Industrialization: 12 Large Developing Countries, 1965-90

Country	Labor Force			Urban Population			Percentage GDP from Non-agriculture		Energy Consumption per Capita (kg of oil equivalent)	
	Percentage Employed in Industry		Average Annual Growth	Percentage of Total		Average Annual Growth Rate	1965	1990	1965	1990
	1965	1980	1980-85	1965	1990	1980-90				
China	8	14	2.5	18	56	3.3*	62	73	178	598
India	12	13	2.0	19	27	3.7	56	69	100	231
Indonesia	9	13	2.4	16	31	5.1	49	78	91	272
Brazil	20	27	2.3	50	75	3.4	81	90	386	915
Bangladesh	5	6	2.8	6	16	6.2	47	62	NA	57
Nigeria	10	12	2.6	17	35	6.0	45	64	34	138
Pakistan	18	16	3.2	24	32	4.6	60	74	135	233
Mexico	22	29	3.2	55	73	2.9	86	91	605	1300
Philippines	16	16	2.5	32	43	3.8	74	78	158	215
Thailand	5	10	2.5	13	21	4.6	68	88	82	352
Turkey	11	17	2.3	34	61	5.9	66	82	257	857
Egypt	15	20	2.6	41	47	3.1	71	83	313	598

*1980-85

Notes: NA = not available

Sources: World Bank, 1988, Table 31; 1988, Tables 3, 5, and 31

Table 4.17 Trends in Enrollment Rates in Primary, Secondary, and Higher Education and Literacy Levels: 12 Large Developing Countries, 1965-90

Country	Percentage of Age Group Enrolled in Education at Different Levels										Adult Literacy Rate (%)				
	Primary Total		Females		Secondary Total		Females		Tertiary Total		Males		Females		Total
	1965	1989	1965	1989	1965	1989	1965	1989	1965	1989	1970	1985	1970	1985	1990
China	89	135	NA	128	24	44	NA	38	0	2	NA	82	NA	56	73
India	74	98	57	82	27	43	13	31	5	11	47	57	20	29	48
Indonesia	72	118	65	115	12	47	7	43	1	7	66	83	42	85	77
Brazil	108	105	108	NA	16	39	16	45	2	11	69	78	63	76	81
Bangladesh	49	70	31	64	13	17	3	11	1	4	36	43	12	22	35
Nigeria	32	70	24	63	5	19	3	16	0	3	35	54	14	31	51
Pakistan	40	38	20	27	12	20	5	12	2	5	30	40	11	19	35
Mexico	92	114	90	112	17	53	13	53	4	15	78	92	69	58	87
Philippines	113	111	111	110	41	73	40	75	19	28	83	86	80	82	90
Thailand	78	86	74	NA	14	28	11	NA	2	16	86	94	72	58	93
Turkey	101	112	83	108	16	51	9	39	4	13	69	86	35	62	81
Egypt	75	97	60	89	26	81	15	71	7	20	50	59	20	30	48

Note: NA = not available

Sources: Srinivasan, 1988, Table 12; UNICEF (1988), Table 4; World Bank, 1992, Tables 1 and 29

Even in 1989, the proportion of children enrolled in primary schools at ages 6-11 was 98 in India compared to 100 or more in China, Brazil, Indonesia, Philippines, Turkey, and Mexico. Although Indonesia had lower primary school enrollment than India in 1965, it had moved ahead of India by 1989. By 1989 only the three Islamic countries, Bangladesh, Pakistan, and Egypt, and Thailand and Nigeria had lower primary school enrollment rates than India. The picture emerges more sharply when we consider primary school enrollment for girls, in India still low at 82 percent in 1989 with only Bangladesh, Nigeria, and Pakistan below this level. India seems to have lost valuable time in providing literacy to the population, especially girls, and the urgency of providing primary school education for girls can hardly be overemphasized. Surprisingly, with regard to the number enrolled in the secondary schools (including higher secondary education from 10th to 12th Standard), India's position is better compared with the other large developing countries. In 1989 India had enrolled 43 percent of its children aged 11-16 in secondary schools, and ranked seventh among the 12.

In higher education in 1989, India is again relatively better off ranking sixth at the level of 11.2 percent enrollment, compared with the other developing countries. On the whole, India seems to have fared better than other large developing countries with secondary and tertiary education than with primary education but the scheme of enforcing compulsory education, especially for girls, has not been adequately carried out.

India had a literacy rate of 48 percent among those aged 15+ in 1990 and ranks tenth among the 12 countries. The literacy rate for females aged 15+ (34 percent) in 1990 is about half that of males. The 1991 census revealed that the literacy rate of those aged 7 and above has risen from 43.7 percent in 1981 to 52.2 in 1991. Among males, the increase is from 56.5 percent to 64.2 percent and among females from 29.9 percent to 39.2 percent. Though this quantum increase among females may not be considered substantial by some, an increase of almost 10 percentage points in a vast country like India is no mean achievement. While the literacy rate has increased, the absolute number of illiterates in the country (among those aged 7 and above) has continued to swell--from 302.06 million in 1981 to 320.41 in 1991, a growth of 18.35 million (3.81 million males, 14.54 million females). India continues to have the largest pool of illiterate population in the world. A divergent picture emerges when states are analyzed separately. Kerala has the highest literacy rate: 89.8 percent among those aged 7 plus (93.6 percent for males, 86.2 percent for females). The southern states (except Andhra Pradesh), Maharashtra, Goa, Mizoram, Delhi, Chandigarh, and most of the northeastern states have significantly higher literacy rates (over 60 percent). Uttar Pradesh, Madhya Pradesh, Rajasthan, and Bihar have lower literacy than the national average, for both genders. For example, Bihar and Rajasthan are lowest with only 23 and 20 percent of females aged 7 and over able to read and write.

When one wishes to analyze the impact of family planning programs on fertility in India, care should be taken to consider not only the diversities in program implementation and management in different states but also the substantial socioeconomic differentials that are developing in different areas. We will attempt such an investigation through macrolevel analysis and case studies of selected states, in the next few chapters.

Chapter 5

ACCEPTANCE AND USE OF CONTRACEPTION

Using modern methods of contraception to space or limit children can be expected to increase in any society under the sheer forces of modernization and development, as these concepts were defined in Chapter 3. The increased literacy levels and improved status of women that are natural consequences or even components of modernization and industrialization tend to promote couples' acceptance and use of contraception. Similarly, public health programs, universal immunization of children, and nutritional and maternal and child health services that developing country governments undertake as part of their developmental efforts contribute to reductions in infant and child mortality which in turn motivates couples to adopt a small family norm and contraceptive methods. The two factors found to be associated almost universally with increasing use of modern contraception and reduced fertility levels in developing countries are improving women's status and educational levels which give them greater empowerment and autonomy in decision making and in reducing infant and child mortality.

While developmental efforts in these directions contribute to raising the demand for family planning by motivating couples for longer spacing and smaller family size, organized family planning programs can be expected to legitimize and facilitate the supply side of contraceptive use. Programs have a motivational and educational role as well. Hence, reducing fertility levels of a population or raising contraceptive prevalence for spacing and limitation should be considered the combined effects of developmental and program efforts. In this chapter, the trends and patterns in contraceptive use in India as a whole and selected states are reviewed to investigate how they can be related to family planning program efforts. Various attempts have been made in the past to isolate the independent effects of program factors vis-à-vis the effects of developmental factors in the observed increases in contraceptive prevalence and declines in fertility. Notable among these works are those by Freedman and Berelson (1976), Srikantan (1977), Lapham and Mauldin (1985), Easterlin and Crimmins (1985), and Mauldin and Ross (1991). While these attempts have been made, mostly, on cross-national data sets using the countries as units of analysis, recently some attempts have been made to conduct similar analysis within India using states as the unit of analysis (Srikantan and Balasubramanian, 1988; Srinivasan, 1989). Trends and patterns of contraceptive use in India and analyze the extent to which program factors have contributed to changes in India's developmental context also will be reviewed.

CONCEPTS OF ACCEPTANCE AND USE IN THE INDIAN PROGRAMS

In Indian family planning programs, the term acceptor has been defined differently for clinical and nonclinical methods. For clinical methods, such as sterilization, IUD, or implant that require surgical or clinical services to the individual, the actual number of acceptors is considered. With nonclinical methods, such as condoms, pills, diaphragm and jelly, or vaginal foam tablets, the number of acceptors is estimated on the basis of number of units of contraceptives distributed to the population at various service delivery points. The number of condoms distributed is divided by 72 (to represent the average number of condoms used by a couple in one year). Similarly, the number of oral contraceptive cycles, foam tablets, and jelly/cream tubes distributed are divided by 13, 72, and 3 respectively assuming (1) that these numbers equal average use of these methods by a couple in one year for contraceptive protection and (2) that they are used. An estimate of equivalent pill users, and users of other conventional contraceptives, is computed each year from the supply data on these methods by dividing the number of units of these items distributed by the appropriate factors and summing them up. Thus in India, while data on sterilizations and IUD insertions connote actual numbers of couples who have accepted these methods, data on acceptors of nonclinical methods used in official program statistics are not actual acceptors or users (identifiable from program records) but estimates or mythical numbers of acceptors derived from the number of contraceptive units distributed by program personnel, commercial channels, etc. They cannot be considered as acceptance or use in the same sense as sterilizations and IUD acceptors.

Another concept used to combine acceptors of different methods of contraception into one summary index in the Indian program is the sterilization equivalent. The sterilization equivalent of acceptors in any period is obtained as a weighted sum of acceptors of different methods with weights of 1 for sterilization, 1/3 for an IUD insertion, 1/18 for an equivalent conventional contraceptive (CC) users, and 1/9 for an equivalent pill user. The weights are chosen to approximate the relative couple years of protection offered by different methods, and are heavily biased toward sterilization, the method emphasized by the program.

The Indian family planning program also uses percentage of couples currently protected (CCP) and percentage of couples effectively protected (CEP) by the program. They are measures derived from program statistics on acceptors of various family planning methods to obtain two indicators of the cumulative level of protection offered by the program in any year because of new acceptance in that year and the carryover effect of previous acceptors.

CCP in a year is obtained by adding those who accepted family planning in the current year to previous acceptors minus drop outs because of (1) death or widowhood, (2) aging (wife's reaching age 45), (3) removal or expulsion of IUD, and (4) method failure. Annual geometric attrition rates that take these factors into account continue increasing as the cohort

of acceptors ages. Annual geometric attrition rates are assumed to be 4.1 percent, 7.1 percent, 13.0 percent, 18.7 percent, and 33.5 percent during successive five-year periods for vasectomy acceptors. Similar attrition rates used for tubectomy acceptors are 2.7, 6.2, 13.5, 28.7 and 53.9 percent. For IUD acceptors, a uniform annual geometric attrition rate of 37.6 percent is used. For conventional contraceptive or pill users, since protection lasts only as long as the method is used, there is no carryover effect. Therefore, only current users of conventional contraceptives and pills are taken into account.

Use-effectiveness levels of different methods, or effectiveness of each method while in use, are considered while computing CEP. Use-effectiveness is taken as 100 percent for sterilization and pills, 95 percent for IUD, and 50 percent for conventional contraceptives. The Indian Ministry of Health and Family Welfare uses these attrition rates and levels of use-effectiveness to estimate state and all-India couple protection rates. Most states use the same rates of method attrition except Gujarat, Punjab, and Kerala which estimate and use their own state-specific attrition rates in calculating their state and district couple protection rates.

For example, Punjab has employed use-effectiveness rates of 67 percent, 25 percent, and 50 percent for IUD, CC, and pill users respectively in estimating state and district CEP values. While estimating the number of eligible couples, required as denominator data for computing district-level rates, all the states except Kerala have used district ratios of eligible couples per thousand population from the 1981 census and population estimates as of April of each year as given by the Committee on Population Projections. Kerala has estimated eligible couples for each of its districts based on a survey of eligible couples carried out there during 1985.

ACCEPTORS: TRENDS AND DIFFERENTIALS

Changing Method Mix over Time

Table 5.1 provides data on the total number of acceptors of different methods of contraception in different plan periods beginning with the Second Five-Year Plan in 1956. Figure 5.1 charts time trends in acceptance of different methods. Two significant points emerge from a study of these time trends. The first is a change in the method mix of acceptors over time. Until March 1977, vasectomy was the dominant contraception method in India. After the backlash of national emergency in 1976 and change of central government in 1977, the method lost its credibility and has never regained its popularity. From April 1974 to March 1978, 8.44 million vasectomies accounted for 46 percent of the total acceptance during this period. In the following 12 years (April 1978 to March 1990), the total number of vasectomies done was only 6.82 million--accounting for only 6 percent of total acceptors during this period. While the vasectomy program could never be revived

after 1977, the number of tubectomies (including laparoscopic sterilizations) has shown a steady rise over the years. While only 0.76 million female sterilizations were done in 1977-78, they increased to 4.1 million by 1987-88.

Second, from 1980, mainly because of the implementation of the recommendations of the Working Group on Population Policy set up by the planning commission in 1979 and implemented in April 1980, the acceptance of IUDs, condoms, and pills for birth spacing has risen substantially. For example, the 1978-80 percentage of IUD acceptors was 12 which increased to 19 percent during 1985-90. More dramatic is the increase in conventional contraceptives (mostly condoms) and pills which together jumped from only 6.5 percent of the acceptance from April 1978 to March 1980 to 60 percent in 1985-90. Recall that acceptors of conventional contraceptives are not real, physically identifiable acceptors, but are estimates based on the number of units of condoms or pill cycles distributed.

Targets and Achievement

From its inception, the family planning program has been seen as target-oriented and time-bound, with targets set as number of acceptors to recruit each year. Tentatively, targets are fixed at the start of each plan for every year of the plan period, as part of the development plan and as an outcome of a theoretical exercise to reduce fertility levels to goals planners desired. Desired fertility reductions in each year of the plan are converted to an estimate of births to be averted in that year, which, in turn, is converted to an estimate of couple years of contraceptive protection to be achieved, which is then used in estimating the number of new acceptors who need to be recruited annually by method. These tentative plan targets are revised each year according to actual performance in the year before, and assigned to the states, generally, based on their population size. Most state governments accept the targets set by the central government and distribute them to lower administrative levels such as districts, cities, and towns according to population sizes. Some states increased these centrally assigned targets by 10 to 20 percent before passing them on. Since state governments receive monetary compensation and awards from the central government based on their family planning performance, especially sterilizations, they are under political and financial pressure to meet the sterilization targets set out by the center. Bureaucratically more efficient states such as Maharashtra and Tamil Nadu usually realized the targets and received numerous national awards.

Table 5.2 contains information on national targets for sterilizations, IUD insertions, CC and pill users since 1966-67 and percentages of targets met until 1989-90. Sterilization targets achieved ranged from a low of 24 percent in 1977-78 (mainly a backlash of the political emergency) to 192.1 in the previous year before the emergency. In all the other years, about 80 percent of targets were realized. For IUD insertions, achievement related to

Table 5.1 Family Planning Performance in Different Plan Periods: India, 1956-90

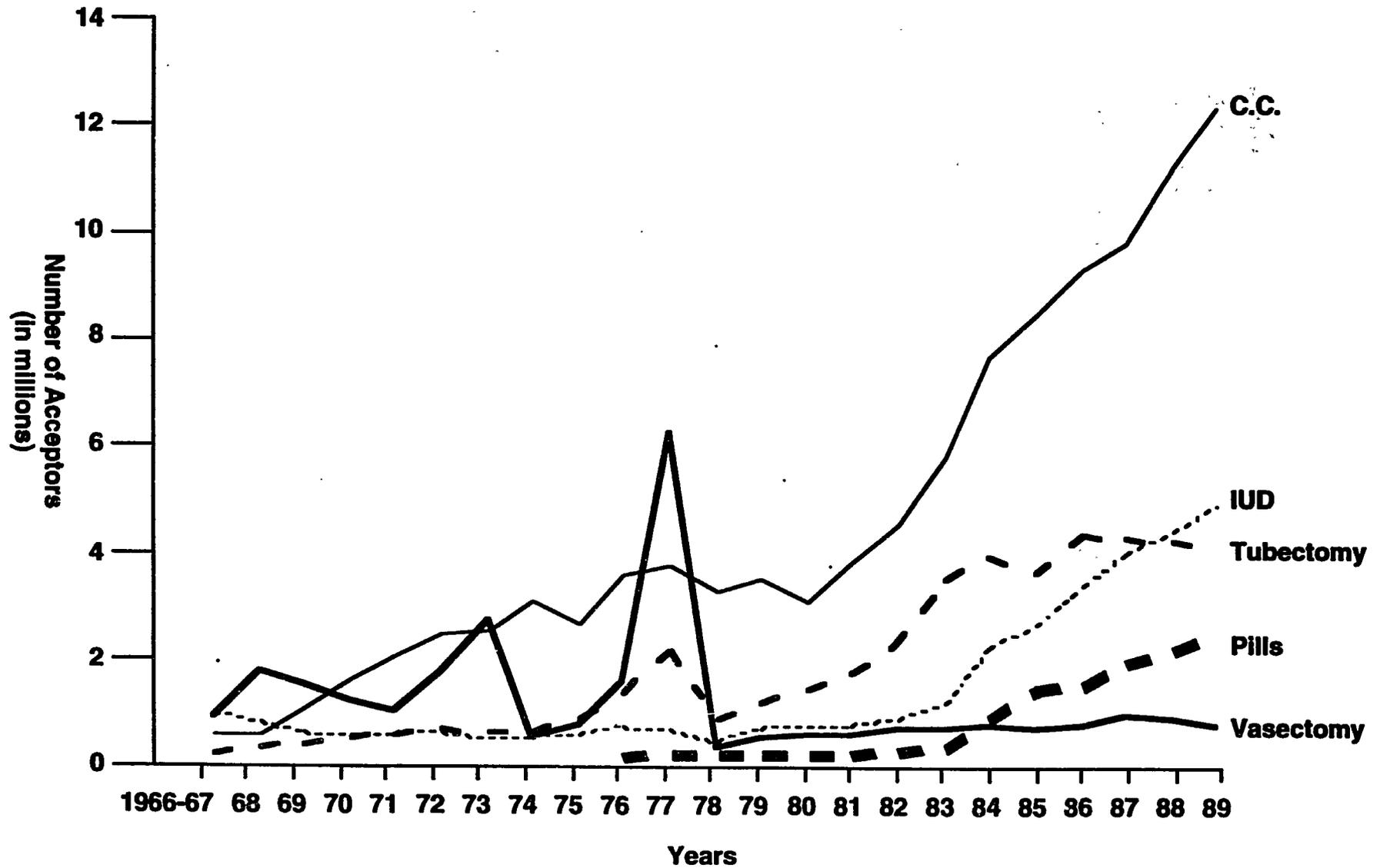
Plan & Period	Sterilizations			IUD	Equivalent CC Users	CEP by End of Period (%)
	Male	Female	Total			
Second Plan 1/1956-12/1960	71 (46.4)	82 (53.6)	153 (100)	NA	NA	0.2
Third Plan 1/1961-3/1966	1069 (38.6)	305 (11.0)	1374 (49.6)	813 (29.4)	582 (21.0)	2.7
Interplan Period 4/1966-3/1969	3817 (51.5)	575 (7.8)	4392 (59.3)	2057 (27.7)	96 (13.0)	7.9
Fourth Plan 4/1969-3/1974	6571 (46.4)	2433 (17.2)	9004 (63.6)	2149 (15.2)	3010 (21.2)	14.7
Fifth Plan 4/1974-3/1978	8437 (45.8)	4795 (26.0)	13,232 (71.8)	1946 (10.6)	3253 ^a (17.6)	22.5
Sixth Plan I 4/1978-3/1980	864 (8.6)	2398 (24.0)	3262 (32.6)	1186 (11.9)	6538 ^a (6.5)	22.3
Sixth Plan II 4/1980-3/1985	2808 (4.9)	14,637 (25.6)	17,445 (30.5)	7172 (12.6)	32,502 ^a (56.9)	32.1
Seventh Plan 4/1985-3/1990	3151 (2.8)	20,582 (18.3)	23,733 (21.1)	21,353 (19.1)	67,566 ^a (60.0)	43.3

^aIncludes equivalent pill users also

Notes: CC = conventional contraceptives; CEP = couples effectively protected; IUD = intrauterine device; NA = not applicable. Figures in parentheses include percentage of total acceptors including sterilizations, IUDs, and equivalent CC users. Acceptors in thousands.

Source: Year Book 1989-90, Family Welfare Program in India; Ministry of Health and Family Welfare, Department of Family Welfare, 1991

Figure 5.1
Family Planning Performance: India, 1966-90



the target varied from a low of 22 percent in 1966-67 to 105 percent in 1986-87. Over the years, the percentage of IUD targets achieved seems to be rising as do achievements for conventional contraception (mostly condoms), up from 20 percent in 1966-67 to over 100 percent in 1989-90. Similarly, for the pill, included in the national program only since the mid-1970s (with low-dosage estrogen pills since the mid-1980s), success has grown steadily from 16 percent in 1979-80 to 131 percent in 1989-90, with some annual fluctuations.

Annual targets for sterilization set at the national level have been practically the same, between 5.5 to 6.0 million from 1983-84 to 1989-90; targets for IUD insertion increased by 3.5 times from 1982-83 to 1989-90, targets of equivalent CC users more than doubled in that period while targets of equivalent pill users quadrupled. There has been a well-planned strategy since 1980 to de-emphasize sterilization and raise targets on the spacing methods. This change in focus comes from a realization at all levels--political, bureaucratic, and academic, that further reductions in Indian fertility can be expected only by promoting the use of spacing methods among young couples of lower parity. See Figure 5.2 for a graph of the targets and achievements in sterilization, IUDs, and CC users for two decades.

CHARACTERISTICS OF ACCEPTORS

Age and Number of Children at Time of Acceptance

The wife's age and the number of children a couple has when they accept a family planning method indicate the extent to which the program has promoted younger, lower parity couples to accept a method. If a family planning program gains universal acceptance, we can expect that the average age at the time of the first adoption of contraception to be low, almost the same as age at marriage, if not before marriage. However, in the early years of a program, especially if it emphasizes sterilization, we can expect age and parity at the time of acceptance to be quite high. The average unprotected years of exposure to pregnancy can be expected to decline with the program's duration.

Kerala and Uttar Pradesh represent the very high and very low levels of contraceptive acceptance (Table 5.3). The wife's average age at the time of her husband's vasectomy in India as a whole changed very little from 1977 to 1989. Wife's age at the time of vasectomy was substantially lower in Kerala than in Uttar Pradesh in 1987-88. Similarly, the average number of living children a couple had at the time of vasectomy has remained practically the same for 12 years. In Kerala the average number of living children of a vasectomy acceptor was on average 1.5 children fewer than in Uttar Pradesh.

Similar observations hold true for tubectomies, except that the women had their operation at a younger age with fewer living children than wives of vasectomy acceptors.

Table 5.2 Annual Achievement of Targets of Family Planning Methods: India, 1966-90

Year	Sterilizations		IUD Insertions		Equivalent CC Users		Equivalent Pill Users	
	Target	Success	Target	Success	Target	Success	Target	Success
1966-67	1263	70.2	4199	21.7	2308	20.1		
1967-68	1543	119.2	2057	32.5	2057	23.1		
1968-69	2109	79.0	791	60.5	2109	45.6	NA	NA
1969-70	2215	64.2	702	65.3	2431	62.1		
1970-71	2600	51.2	900	52.9	4800	40.9		
1971-72	2079	105.2	831	58.8	3829	61.5		
1972-73	5697	54.8	949	37.4	4258	56.3		
1973-74	2268	41.6	669	55.5	4303	70.0		
1974-75	2000	67.7	600	72.1	3500	72.0	NA	NA
1975-76	2492	107.1	912	66.6	4538 ^a	80.9 ^a		
1976-77	4299	192.2	1137	51.1	4690 ^a	78.7 ^a		
1977-78	3990 ^b	23.8	1000	32.6	5000 ^a	65.1 ^a		
1978-79	3965	37.4	600	91.9	4000 ^a	86.7 ^a		
1979-80	3049	58.3	1149	55.2	5003	59.7	800	16.4
1980-81	2896	70.9	791	79.4	5042	73.7	495	18.4
1981-82	2896	96.4	791	94.9	5042	88.0	495	24.2
1982-83	4522	88.1	1512	72.5	6502	88.7	503	36.4
1983-84	5900	76.8	2500	85.4	7900	97.0	1100	66.3
1984-85	5823	70.1	3183	80.5	10000	85.1	1000	129.0
1985-86	5560	88.2	3244	100.9	9515	98.7	960	141.4
1986-87	6000	84.1	3750	104.9	10500	93.6	1000	182.9
1987-88	6000	82.3	4250	102.5	10750	105.5	2000	103.2
1988-89	5374	87.1	4970	97.6	13043	95.2	2140	112.9
1989-90 ^c	5449	76.1	5253	94.0	14016	101.2	2094	130.9

^aIncludes equivalent pill users

^bTargets (levels of expectation) not insisted on for the year

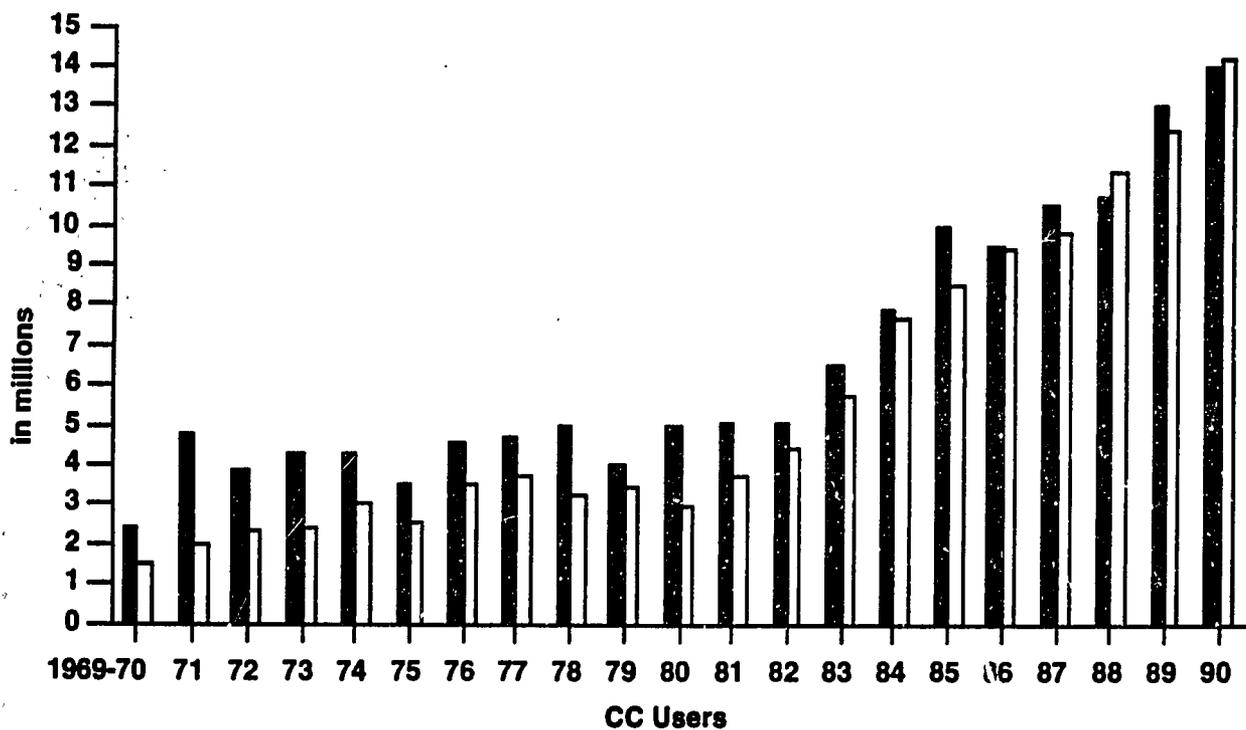
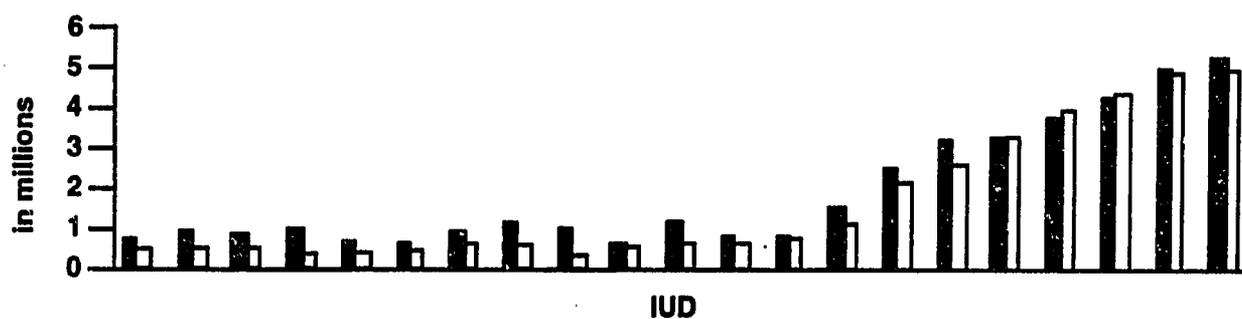
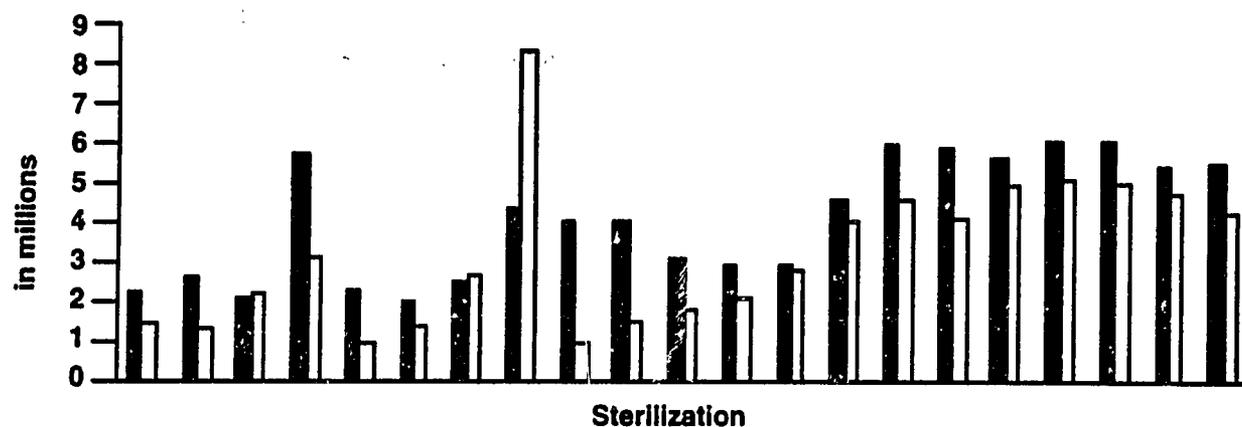
^cFigures provisional

NA = Not available

Notes: CC = conventional contraceptives; targets in thousands; successes in percentages

Source: Year Book 1989-90, Family Welfare Program in India; Ministry of Health and Family Welfare, Department of Family Welfare, 1991

Figure 5.2
Targets and Achievements in Family Planning -- India, 1969-90



Target
 Achievement

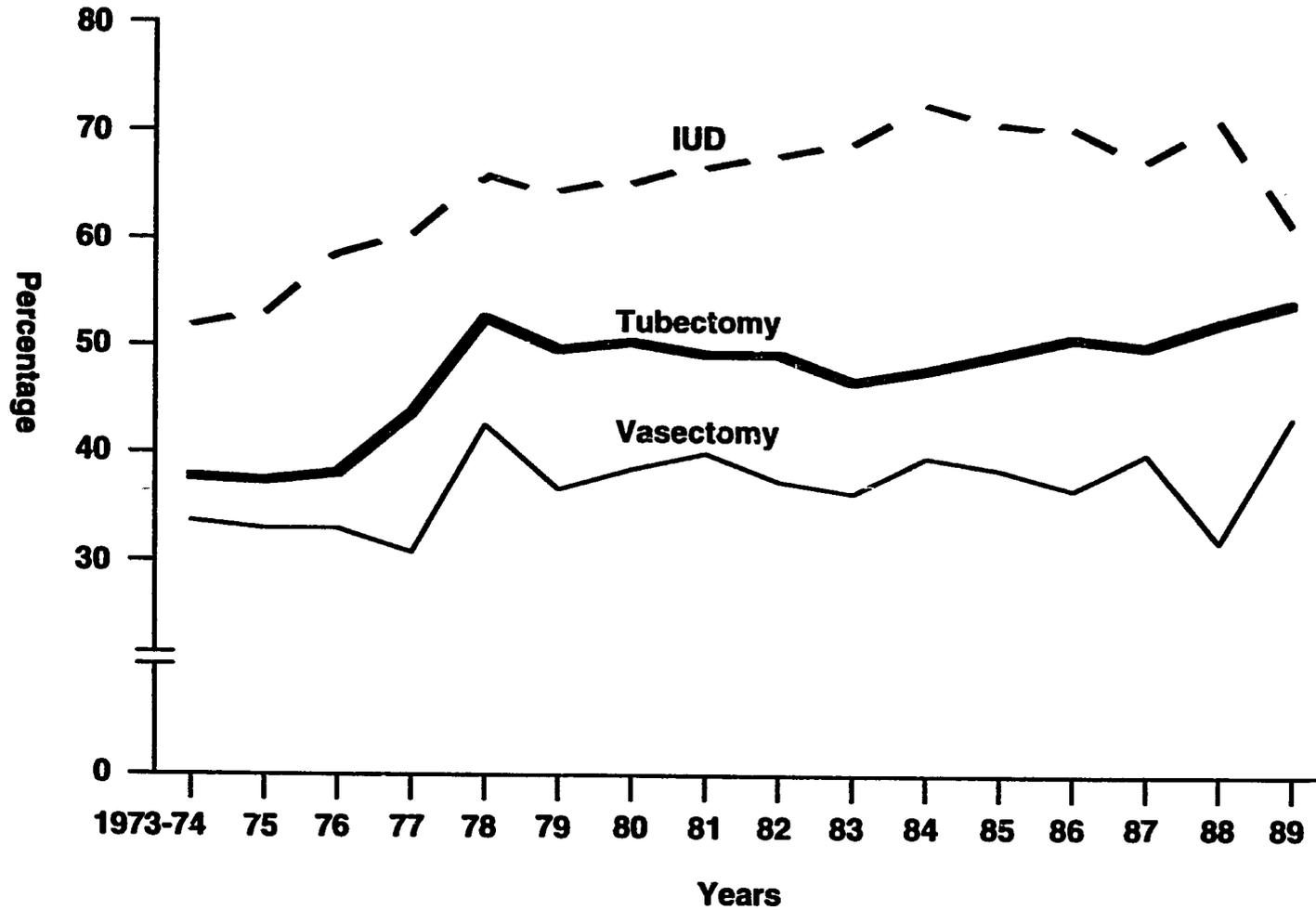
Note: CC data for 1976-90 include pill users; 1989-90 data are provisional

Table 5.3 Mean Age of Wife and Living Children at the Time of Acceptance of Three Family Planning Methods: Kerala, Uttar Pradesh, India, 1967-89

Year & Location	Vasectomy		Tubectomy		IUD	
	Age	Children	Age	Children	Age	Children
1967 India	34.6	4.2	34.3	4.5	32.8	3.8
1977-78 India	31.5	3.1	30.1	3.5	28.5	2.6
1987-88 India	32.4	3.6	30.2	3.3	27.4	2.3
Kerala	29.1	2.6	28.6	3.0	25.9	2.0
Uttar Pradesh	33.3	4.1	33.7	3.9	29.5	2.7
1988-89 India	31.3	3.6	29.9	3.3	29.0	2.3
Kerala	29.1	2.6	28.7	3.0	25.9	2.0
Uttar Pradesh	30.8	4.0	32.5	3.8	33.9	2.7

Source: Year Book 1989-90, Family Welfare Program in India; Ministry of Health and Family Welfare, Department of Family Welfare, 1991

Figure 5.3
Percentage of Acceptors (Wives) under Age 30: India, 1973-89



The absence of a substantial decline in age over time indicates that sterilization continues to attract, until recently, only women of relatively higher age and parity, probably after they have achieved desired family size. Kerala women are about five years younger and had about one fewer child than Uttar Pradesh women when they had tubectomies. With a program of such long duration as India's, one should have expected a sharp decline in the age at acceptance of all methods, including sterilizations, as in Kerala. That this has not occurred implies that the family planning program is yet to find wide acceptance among younger couples.

Age at IUD acceptance declined from 1967 to 1987-88 with a rise the next year. The average number of children when the IUD is accepted also fell from 1967 to 1987. Here, too, are significant differences between Kerala and Uttar Pradesh. Kerala women accept the method earlier by as much as 8 years in 1988. Thus, for all the methods at the same level of acceptance (rates per 1000 population or 1000 eligible couples), we can expect a significantly greater impact on fertility in Kerala compared to Uttar Pradesh because Kerala women accepted contraception at a much younger age and lower parity.

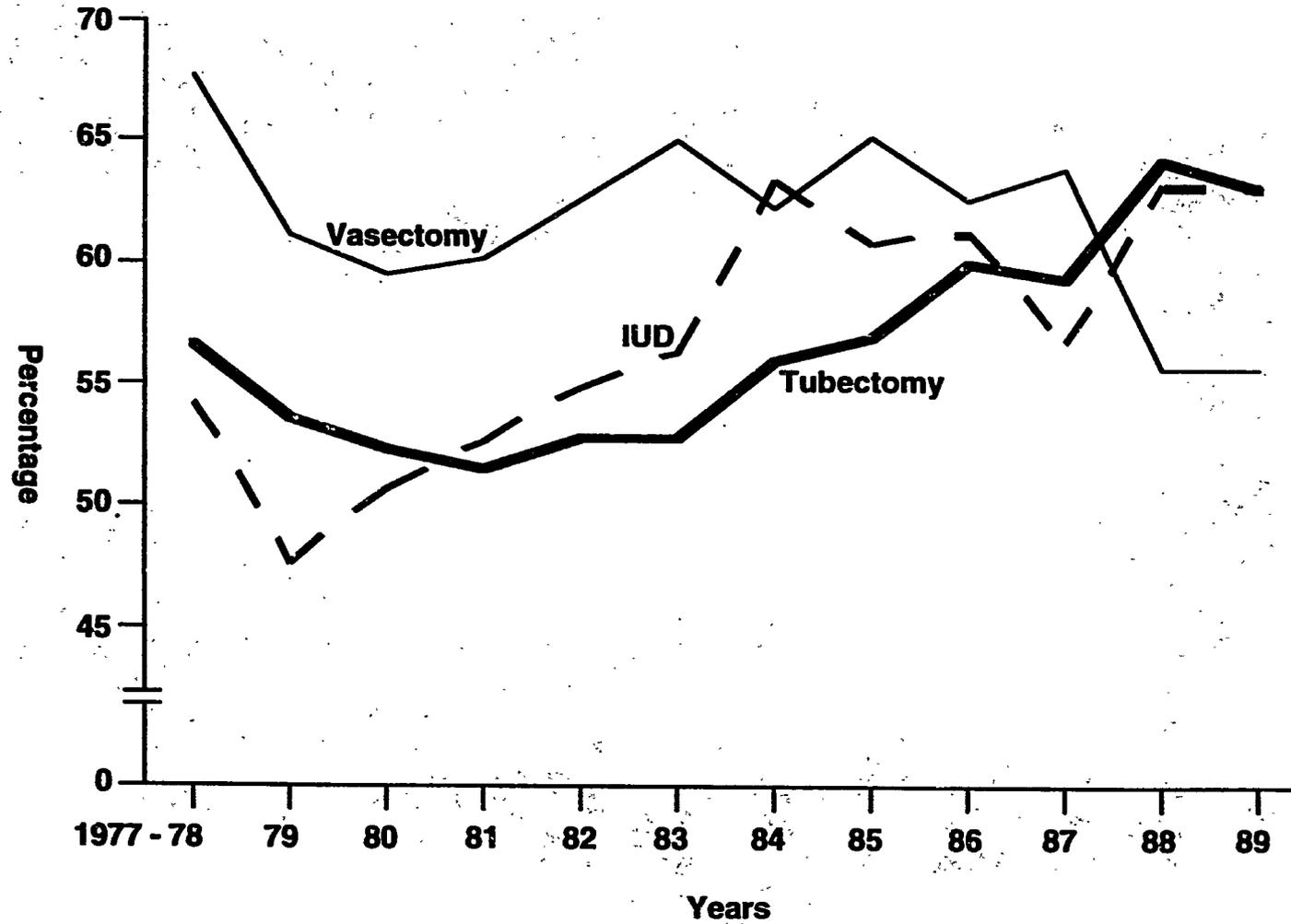
Figure 5.3 is a graph of trends in wife's age at the time of vasectomy, tubectomy, and IUD acceptance. The significant finding from this graph is the relatively small variation in the proportion of tubectomy (40-50 percent) and IUD (50-68 percent) acceptors under age 30. For vasectomy acceptors, the proportion whose wives were under 30 at the time of their operation ranged between 30 to 40 percent.

Figure 5.4 charts the percentage of vasectomy, tubectomy, and IUD acceptors with three or fewer living children in 1977-78 to 1988-89. The proportions ranged generally between 50 to 65 percent for vasectomy, 60 to 70 percent for tubectomy and 70 to 85 percent for IUDs. Male sterilizations show no steady rise in acceptors with three or fewer living children; for IUDs, and female sterilizations, such a trend is discernible.

Rural-Urban Differentials

About three-fourths of Indians live in rural areas, in villages. To the extent that the family planning program can reach and serve rural couples, it can be considered effective. Figure 5.5 shows trends for rural acceptors of sterilization and IUD from 1970-71 to 1989-90. During the past 20 years, rural acceptors of sterilization constituted about 65 percent of total sterilizations, fluctuating rather widely around this value without any trend. For IUDs, there is a steady increase in the proportion of rural acceptors from 58 percent in 1980-81 to 77 percent in 1989-90. Thus, there appears to be greater rural acceptance of spacing methods from program sources than permanent ones, perhaps because nonprogram sources of supply and facilities for spacing methods (drugstores, hospitals, nursing homes, and physicians) are relatively scarce in rural areas. For their

Figure 5.4
Percentage of Acceptors (Wives) with Three or Fewer Living Children: India, 1977-89



family planning needs, advice, and services, rural people still depend to a large extent on the governmental program unlike urban residents.

Figures 5.6 and 5.7 show rural interstate differentials in sterilization and IUD acceptance as a percentage of total acceptors in 12 large Indian states for 1989-90. The maximum rural acceptance of sterilization is in Uttar Pradesh (86 percent) and the minimum in Kerala (46 percent) with the all-India figure at 72 percent. Urban percentages respectively were 18, 19 and 23. As the program reaches a high level of coverage in a state, as in Kerala, rural sterilization seems to decline as acceptance of spacing methods rises. Maximum rural IUD acceptance in Orissa and Uttar Pradesh is about 90 percent; the minimum in Andhra Pradesh is 62 percent.

CONTRACEPTIVE USE

Couple Protection Rate: State Level

The number of acceptors of various contraceptive methods must be translated into actual use for protection from pregnancy to influence fertility levels of a population. In public health parlance while acceptance corresponds to incidence of a disease or new cases, the term use corresponds to prevalence at a point in time which is the cumulative effect of current year acceptors plus the carryover effect of earlier acceptors continuing to use the method in the current year. Sterilization acceptance is synonymous with use and any acceptor continues to receive protection from the method until the wife exits the reproductive age, is widowed, or dies. This is not true with other methods. IUDs may be expelled or removed and similarly other temporary methods may be discontinued after adoption. In the Indian program, even the number of acceptors of condoms and pills are estimated from supply data, so acceptance and use data for these methods are cruder than for sterilization and IUD insertions. Data on continuation rates for spacing methods after their adoption are required for converting acceptance into use.

Methods are not equally effective in preventing pregnancy. The extent to which methods are effective in averting pregnancy during the period of use is measured by the coefficient of use-effectiveness. In the Indian program these coefficients are assumed to be 1.0 for sterilization and pills, 0.95 for IUDs, and 0.50 for other conventional contraceptives.

A measure of contraceptive use widely applied for assessing family planning program impact nationally and internationally is the contraceptive prevalence rate or CPR which measures the percentage of currently married women of reproductive age who are protected by contraception at a given time or in a given year. Such a measure can be computed only through a random sample of women of reproductive age in the population such as the World

Figure 5.5
Percentage of Rural Acceptors of Sterilization and IUDs: India, 1970-90

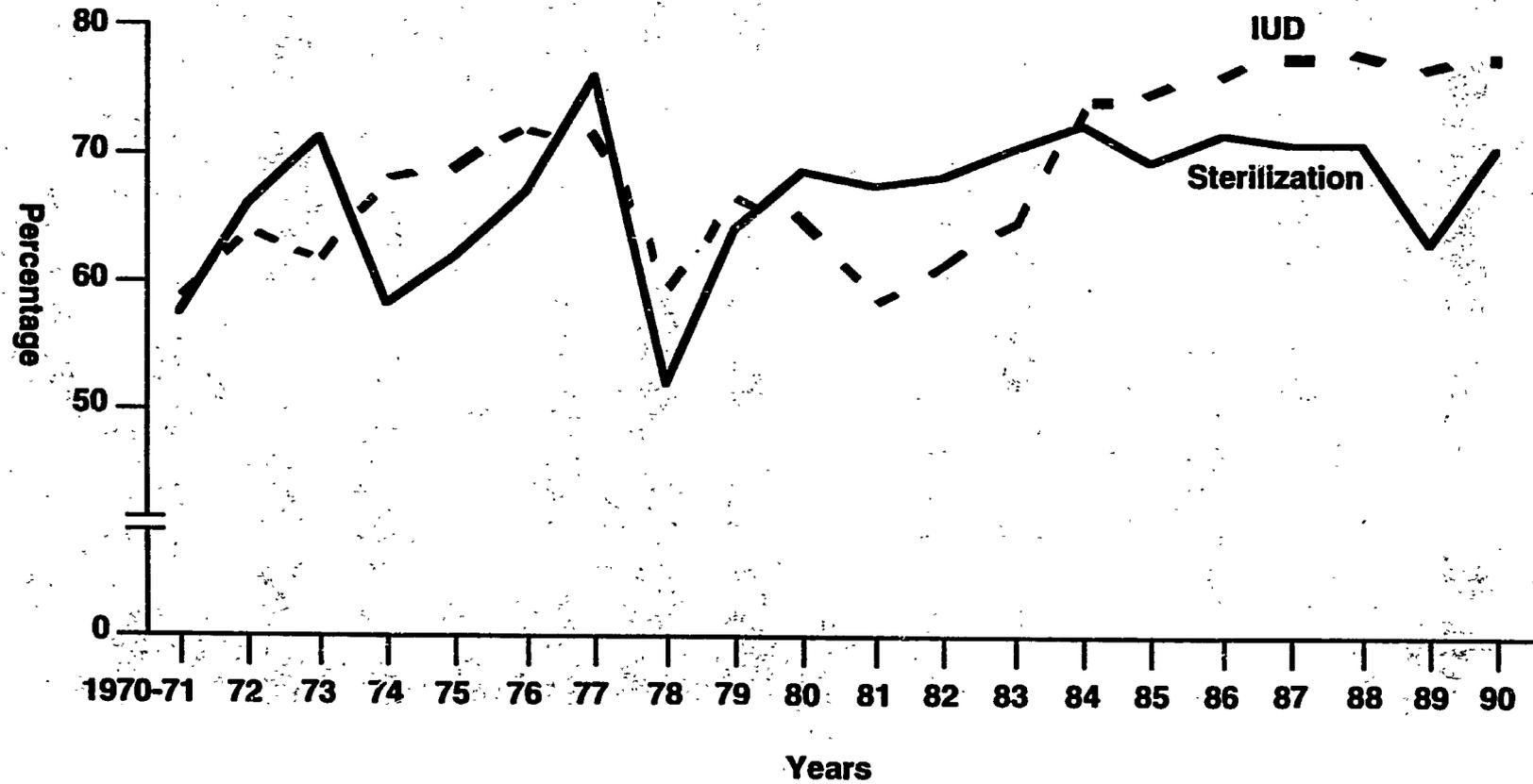


Figure 5.6
Percentage of Rural Sterilization Acceptors: India, 1989-90

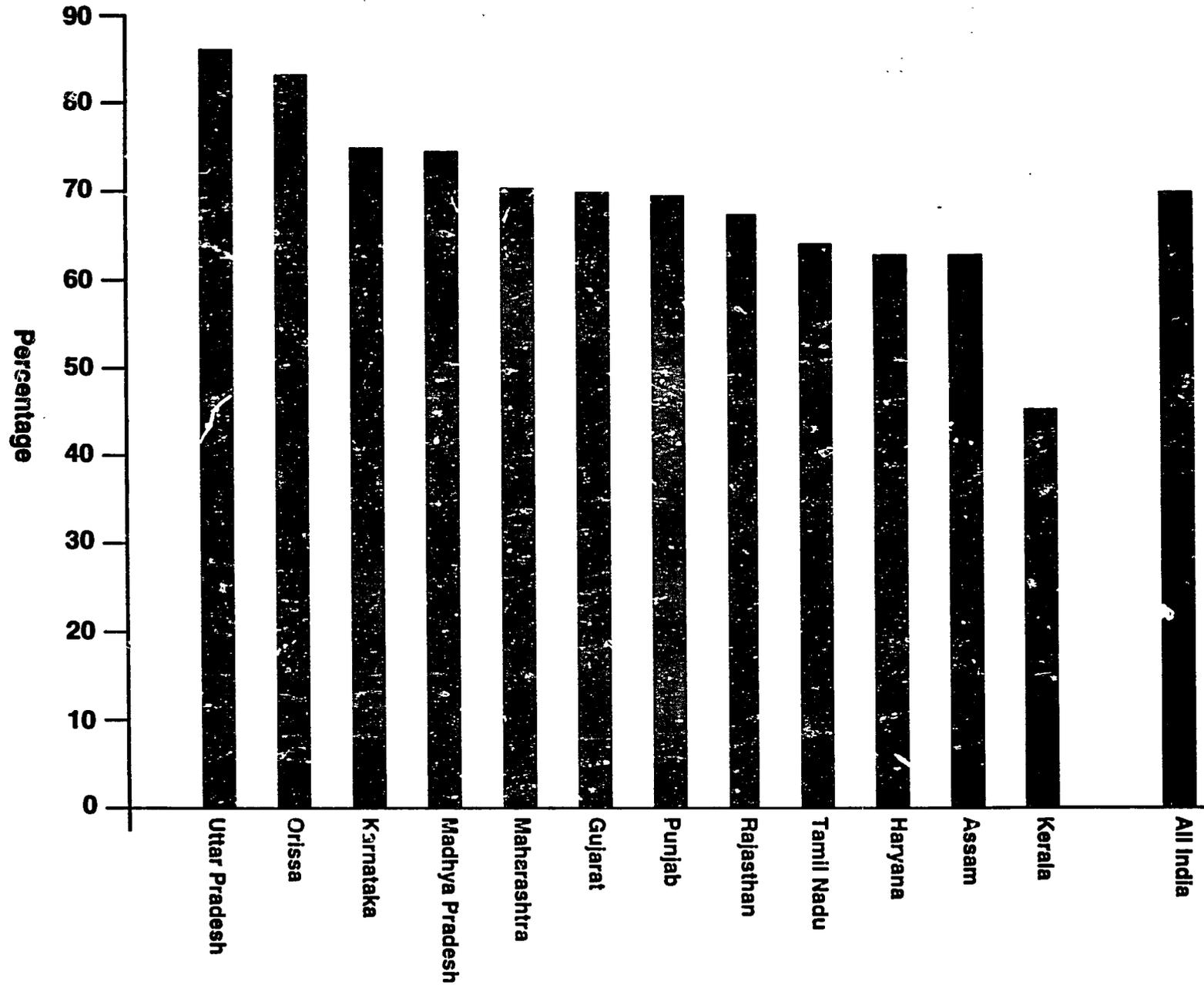
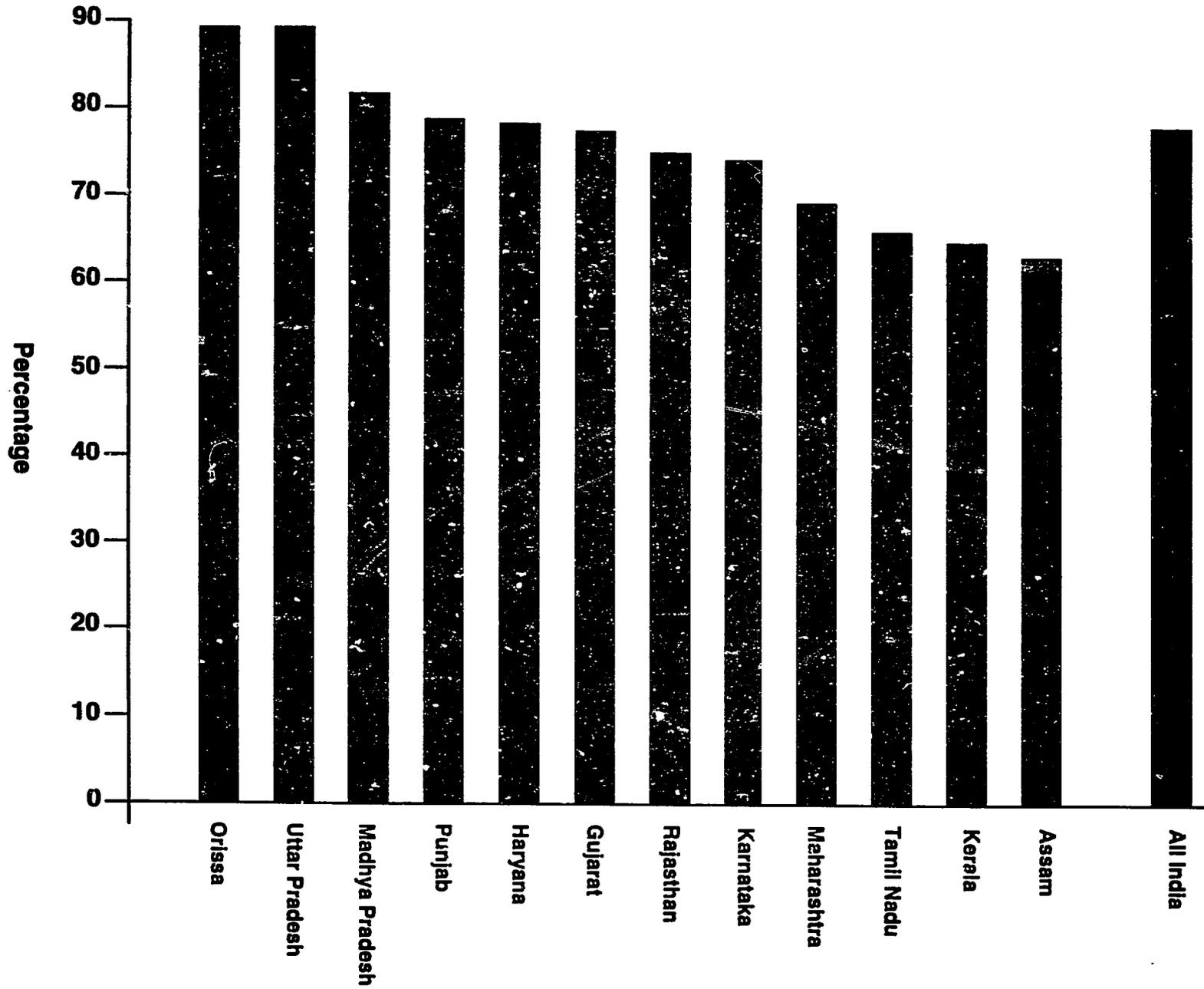


Figure 5.7
Percentage of Rural IUD Acceptors: India, 1989-90



Fertility Surveys (1974-84), Contraceptive Prevalence Surveys (1984-89), and the Demographic Health Surveys Phase I (1984-90) undertaken with international financial assistance, or the large-scale sample surveys conducted by individual countries. Even when such surveys have been conducted, they are generally single-round surveys and it is difficult to assess the secular changes in CPR values over time and the factors that influence such changes.

In India, as an approximation to the CPR values, data from family planning service statistics systems on acceptors of various family planning methods are used. Information on the number of acceptors by method, their characteristics such as age, parity, rates of discontinuation of various methods, and life table survivorship values for the population is used to project the number of contraceptive users within the reproductive ages in the future. Any errors in the data on acceptors tend to be cumulated in such an exercise and the index of contraceptive protection rate computed from service statistics data must be viewed with caution.

In the Indian program two indexes of use adopted in the family planning service statistics system are the percentage of couples currently protected (CCP) and the percentage of couples effectively protected (CEP). The CEP values computed in the Indian program for any year should theoretically be close to the contraceptive prevalence rates (CPR) computed from a population-based survey for the same year if all the input data from the family planning service statistics are complete and reliable. The difference between CPR and CEP should be small, if not negligible, because of the addition of data on traditional methods of contraception and nonprogram sources that are not included in service statistics. In reality, given the circumstances of the Indian program, which has been highly target-oriented from the very beginning, the family planning service statistics data may exaggerate acceptances in numbers. Data quality may vary over time and among states. Particularly vulnerable to biases and errors are data on acceptors of various spacing methods which are "guesstimates" anyway. With these limitations in mind, an analysis of trends in couple protection rates, current as well as effective (CCP and CEP) is presented, as obtained from service statistics.

Effective couple protection (CEP) for the country as a whole has increased by 34 percentage points in 20 years: from 9.4 in 1970 to 43.3 in 1990 (Table 5.4). Unfortunately, such an increase in CEP values was not accompanied by concomitant declines in fertility rates--CBR or TFR values. For example, India's crude birth rate declined from 33.7 in 1980 to 29.4 in 1990 (about 13 percent) while CEP rose by about 21 percentage points during this same period. This discrepancy can partly be attributed to errors and biases in the CEP values, partly to differentials in the fertility potentials of acceptors and nonacceptors, and partly to changes in the age-sex-marital status distribution.

Table 5.4 Percentage of Couples Effectively Protected (CEP) by Any Modern Family Planning Method, as of March 31: India States and India, 1970-90

State/Union Territory	Percentage of Couples Protected			Average Annual Increase in CPR	
	1970	1980	1990	1970-80	1980-90
1 Andhra Pradesh	9.4	25.6	42.9	1.6	1.7
2 Aruna. Pradesh	0.5	1.8	9.6	0.1	0.8
3 Assam	5.1	19.3	28.2	1.4	0.9
4 Bihar	4.8	12.4	26.3	0.8	1.4
5 Goa	7.1	16.3	33.2	0.9	1.7
6 Gujarat	11.0	31.3	56.5	2.0	2.5
7 Haryana	11.2	29.1	58.9	1.8	3.0
8 Himac. Pradesh	8.5	24.4	50.1	1.6	2.6
9 Jammu-Kashmir	7.0	11.0	21.7	0.4	1.1
10 Karnataka	9.2	22.3	46.0	1.3	2.4
11 Kerala	13.9	28.9	54.4	1.5	2.6
12 Madhya Pradesh	9.2	21.7	38.4	1.3	1.8
13 Maharashtra	14.6	34.5	54.4	2.0	2.0
14 Manipur	3.1	10.1	26.4	0.7	1.6
15 Meghalaya	0.0	6.4	5.2	0.6	0.1
16 Mizoram	0.0	11.5	39.1	1.2	2.8
17 Nagaland	0.6	0.9	4.6	0.03	0.4
18 Orissa	12.3	26.9	40.7	1.5	1.4
19 Punjab	17.2	23.5	73.2	0.6	5.0
20 Rajasthan	4.9	13.3	30.0	0.8	1.7
21 Sikkim	0.0	7.4	19.9	0.7	1.3
22 Tamil Nadu	12.5	28.2	57.1	1.6	2.9
23 Tripura	4.6	10.1	17.0	0.6	0.7
24 Uttar Pradesh	5.5	11.5	33.3	0.6	2.2
25 West Bengal	9.5	21.4	33.1	1.2	1.2
UNION TERRITORIES					
26 Andaman & Nicobar Islands	5.3	13.4	40.4	0.8	2.7
27 Chandigarh	12.0	27.3	43.1	1.5	1.6
28 Dadra & Haveli	1.9	13.5	48.8	1.2	3.5
29 Daman & Diu	*	12.4	30.0	1.2	1.8
30 Delhi	16.1	34.8	41.7	1.9	0.7
31 Lakshadweep	3.0	8.2	9.0	0.5	0.1
32 Pondicherry	15.1	37.1	60.3	2.2	2.3
33 ALL INDIA	9.4	22.3	43.3	1.3	2.1

Source: Year Book 1989-90, Family Welfare Program in India; Ministry of Health and Family Welfare, Department of Family Welfare, 1991

* Combined estimate for Goa, Daman and Diu given against Goa

Possibilities of errors and biases contained in the acceptor and use data find support from the figures on percentage of couples protected by different methods of family planning computed for 1990 (Table 5.5). In 1990 while IUDs, condoms, and pill users contributed jointly to 30.5 percent of the total protection offered, ten years earlier their share was only 10.6 percent of protection offered. In actual numbers, it is estimated from program data that as of April 1990, about 18.74 million eligible couples in the country were protected by any of these spacing methods available in the program, while another 42.72 million were protected by sterilization, totalling 61.46 million couples protected. The figures on pill and condom users, estimated to be 9.83 million during 1989-90, are particularly vulnerable to errors because they are based on supply data.

As the percentage of couples protected by these methods increases further, assuming that present computing procedures are followed, the discrepancy between use and fertility can be expected to increase. The annual rate of increase in CEP values during the 1980s is substantially higher than in the earlier decade (2.1 percent compared to 1.3 percent). Among the states, the maximum CEP value is observed in Punjab (73.2 percent--rather unlikely in view of Punjab's TFR of 3.4 in 1987) and the lowest in Nagaland at 4.6 percent. The family planning service statistics system has obviously over-reported the extent of acceptance and use of contraception in some states, and the degree of over-reporting can be expected to vary. The average annual increase in CEP values during 1980-90 was more than in 1970-80 in most states. While only three states or union territories had recorded an increase of 2 percent or more annually in CEP during 1970-80, in the next decade, 13 states/union territories recorded such an increase. An increase in CEP by over 20 percentage points in 1980-90, which can be considered to be a remarkable achievement (a net addition of about 2 percent per year), has been realized in Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh and Himachal Pradesh and in the union territories of the Andaman and Nicobar Islands; Dadra and Nagar Haveli; and Mizoram and Pondicherry. Such a steep rise in couple protection over ten years almost throughout the country certainly indicates a rapid diffusion of contraceptive use.

District Level Percentage of Couples Effectively Protected (CEP)

An analysis of recently available data on district-level percentage of couples effectively protected (CEP) indicates that in the 17 large states of India covering more than 90 percent of the population (396 districts), only 26 districts with a mere 6 percent of the population had recorded CEP values of under 20 percent as of April 1990. These 26 districts are 6 in Assam, 8 in Bihar, 9 in Jammu and Kashmir, 2 in Rajasthan, and 1 in West Bengal. Gujarat, Haryana, Kerala, Maharashtra, Punjab, and Tamil Nadu do not have any districts with a CEP value under 40 percent as of that date. This is a remarkable achievement in

Table 5.5 Percentage Distribution of Couples Effectively Protected by Methods, as of March 31: India, 1980-90

State	Sterilization		IUD		CC & Pill	
	1980	1990	1980	1990	1980	1990
Andhra Pradesh	98.0	81.3	1.2	7.7	0.8	11.0
Assam	95.8	91.9	2.7	5.6	1.5	2.5
Bihar	95.3	84.8	2.6	12.2	2.1	3.0
Gujarat	90.4	69.7	3.8	17.2	5.8	13.1
Haryana	78.6	54.9	11.7	22.9	9.7	22.2
Himachal Pradesh	91.1	73.5	6.3	16.0	2.6	10.5
Jammu & Kashmir	86.6	85.2	8.6	11.1	4.8	3.7
Karnataka	90.8	82.8	5.6	11.5	3.6	5.7
Kerala	95.9	82.7	3.2	9.0	0.9	8.3
Madhya Pradesh	95.7	68.9	2.3	12.5	2.0	18.6
Maharashtra	96.7	77.2	1.2	12.1	2.1	10.7
Orissa	94.9	77.1	3.1	12.8	2.0	10.1
Punjab	77.6	52.9	12.6	30.6	9.8	16.5
Rajasthan	87.1	73.0	4.9	14.0	8.0	13.0
Tamil Nadu	95.5	77.9	2.8	15.4	1.7	6.7
Uttar Pradesh	75.8	58.7	16.6	30.8	7.6	10.5
West Bengal	95.1	86.7	1.8	6.0	3.1	7.3
India	89.4	69.5	4.4	14.6	6.2	15.9

Note: All three methods combined = 100 percent. CC = conventional contraceptives

Source: Year Book 1989-90, Family Welfare Program in India; Ministry of Health and Family Welfare, Department of Family Welfare, 1991

these states with fairly large populations--often larger than some developing countries, and comparable to the successes of Korea, Thailand, Malaysia, and Singapore, cited frequently for having achieved a high level of couple protection rates. See Table 5.6 for the frequency distribution of districts according to April 1990 CEP. Except for Assam, Bihar, Jammu and Kashmir, Rajasthan, and Uttar Pradesh, all the other states are becoming increasingly homogenous with regard to contraceptive use.

Relationship between CEP and Literacy Levels

Percentage of Couples Effectively Protected (CEP) at the state level are strongly associated with literacy. The general literacy rates of individuals aged seven and above from the 1991 census were correlated with the CEP in April 1990 in 16 large states (excluding Jammu and Kashmir); the correlation coefficients were 0.57 and 0.58 with male and female literacy, both statistically significant at the 5 percent level. If we consider couple protection rates by sterilization only, and relate them to literacy levels, the correlation coefficients increased substantially to 0.81 and 0.80 with male and female literacy rates, significant at the 1 percent level. This finding indicates that the cumulative level of protection offered by sterilization in a state is significantly and positively correlated with general literacy. Thus, the view held in some quarters that India's sterilization program with its incentives to acceptors has attracted largely illiterate and low-income groups to the family planning fold is not empirically validated. If that were the case, we would have found a negative correlation between sterilization protection and literacy. When the correlation analyses were repeated within each state using the district as the unit of analysis, and also for the country as a whole, the conclusions reached from state-level analysis were mostly validated except in Gujarat, Haryana, Karnataka, Punjab, and West Bengal.

Contraceptive Prevalence Rate (CPR)

The measure of couple protection rate (CEP) discussed above is derived from family planning service statistics data and is subject to varying degrees of errors and biases. More reliable estimates of contraceptive prevalence and their correlates are expected to come from population-based sample surveys in which data on contraceptive use and related variables are collected directly by personal interviews with a representative sample of eligible couples. In India such nationwide surveys are few. For largely political reasons, India did not participate until very recently in the international survey series--the World Fertility Survey (1974-83), the Contraceptive Prevalence Survey (1983-86), and the Demographic Health Survey (Phase I) organized with financial support from the United States Agency for International Development (USAID) and the Westinghouse Corporation, 1985-90. Only

Table 5.6 Frequency Distribution of Districts by March 31 - Percentage of Couples Effectively Protected in India and Large States - 1990

State	Very Low <20%	Low 20-30%	Average 30-40%	Good 40-50%	Very Good 50+ %	Total
Andhra Pradesh	0	3	7	5	8	23
Assam	6	7	0	1	3	17
Bihar	8	23	6	2	0	39
Gujarat	0	0	0	1	18	19
Haryana	0	0	0	1	11	12
Himachal Pradesh	0	0	2	3	7	12
Jammu & Kashmir*	9	4	0	1	0	14
Karnataka	0	0	6	9	5	20
Kerala	0	0	0	3	11	14
Madhya Pradesh	0	4	18	15	8	45
Maharashtra	0	0	0	5	7	30
Orissa	0	0	5	7	1	13
Punjab	0	0	0	1	11	12
Rajasthan	2	14	10	0	0	26
Tamil Nadu	0	0	0	4	17	21
Uttar Pradesh	0	7	47	7	0	61
West Bengal	1	6	6	4	1	18
Total	26	68	107	69	126	396
March 31, 1990	28	74	100	84	104	390
March 31, 1989	35	95	94	81	84	389
March 31, 1988	48	102	92	68	63	373
March 31, 1987						

*as of March 31, 1989

Source: India, Ministry of Health and Family Welfare, 1991

since the end of 1991 has India participated in Phase II of the Demographic Health Survey conducted as the National Family Health Survey by the Indian Ministry of Health and Family Welfare with the International Institute for Population Sciences, Bombay, as the nodal agency, and financial support from USAID and technical assistance from the East-West Population Institute, Hawaii.

In 1970, 1980, and 1988, the Ministry of Health and Family Welfare, commissioned a market research organization, Operations Research Group, Baroda (ORG), to organize nationwide household sample surveys to obtain statistically reliable estimates of rural and urban contraceptive prevalence levels and associated factors at the state level. Fieldwork for these three surveys was conducted from July 1970 to January 1971, January 1980 to January 1981, and July 1988 to February 1989 and covered fairly large samples of households:

- 25,330 eligible couples with wives aged 15-44 in ORG Survey I in 1970
- 34,831 eligible couples with wives aged 15-49 in ORG Survey II in 1980
- 44,918 eligible couples with wives aged 15-44 in ORG Survey III in 1988.

In these surveys half of the respondents were husbands interviewed by male investigators, and half were wives interviewed by female investigators.

These three surveys offer a wealth of information on the levels of awareness, knowledge, and attitudes about family planning, contraceptive use, fertility, and related factors of a cross-section of Indian couples at three times when they were undergoing demographic transitions. They also provide an independent assessment of the diffusion of the family planning message and practice in the community within and outside the government program and a validation of couple protection rate figures compiled from service statistics data.

Table 5.7 provides estimates of CPR, by method, as obtained from the three ORG surveys and estimates of CEP from the family planning service statistics data from the Ministry of Health and Family Welfare for the period corresponding to two of three surveys (1980-81 and 1988-89). While the government estimates incorporate explicit adjustments for use-effectiveness of methods, the survey measures have no such adjustment. However, since current users of contraception reported in surveys are largely survivors of acceptors of various methods in the past (after allowing for attrition for various reasons) and currently not pregnant, use-effectiveness is implicitly built into the CPR measures. The percentage of couples protected by any method of contraception (according to the survey) increased by 31.3 percentage points from 1970 to 1988, while the corresponding government couple protection estimates rose 29.5 points. The survey estimates are consistently higher than the official figures.

**Table 5.7 Survey-Based Contraceptive Prevalence Rates (CPR)
Compared with Effective Couple Protection Rates (CEP) Derived from
Government Service Statistics: India, 1970-88**

Method	ORG Survey (CPR)			Service Statistics (CEP) ^d		
	1970 ^a	1980 ^b	1988 ^c	1971	1980	1988
Sterilization	6.3	22.4	31.3	8.0	19.0	29.0
IUD	0.7	0.5	1.9	1.4	1.0	5.2
Condom	2.6	4.4	5.3	1.0	2.2	4.5
Pill	0.3	0.8	1.4	1.0	0.1	1.2
Traditional Methods	4.1	7.2	5.0	NA	NA	NA
Total Current Users	13.6	35.3	44.9	10.4	22.3	39.9
Past Users	4.6	4.4	5.1	NA	NA	NA

^aRefers to middle of survey period, October 1970, couples with wife aged 15-44. Total of all methods exceeds total users of any method since some couples were using more than one method, e.g., rhythm and condom, condom and withdrawal.

^bRefers to middle of survey period, July 1980, wife aged 15-49

^cRefers to middle of survey period, November 1988, wife aged 15-44

^dAs of March 31 of the year; wife aged 15-44

Note: NA = not applicable.

Sources: India, Ministry of Health and Family Welfare, Department of Family Welfare, 1991; Operations Research Group, 1971, 1983, 1990

The survey data include use of traditional methods of contraception while the government estimates are based only on modern methods from program sources. Comparing only use of modern contraceptives from survey and records, they are 9.5 compared to 10.4 in 1970; 28.1 compared to 22.3 in 1980, and 39.9 each in 1988. Thus, while the survey estimates seem to agree precisely with the official figures in 1988, the discrepancy was quite large in 1980. The discrepancy seems to be attributable to disparities in the use of spacing methods, especially the IUD and condom, which were overestimated in the official statistics by about 2.3 percentage points over the survey figures in 1988 and underestimated by almost the same figure in 1980. The survey reveals that the increased use in the 1970s is larger in percentage points as well in absolute numbers than in the 1980s. The use of reversible methods of contraception has increased only slowly during the last two decades.

Table 5.8 presents survey-based estimates (CPR) and service statistics based on official figures on contraceptive use for 1980 and 1988 for 22 states and union territories, as available on a comparable basis. Comparing only the CPR values from modern methods with the official CEP values for 1980, we find that only in Orissa and Tamil Nadu do the figures come fairly close (within 10 percent of the value of the CPR). All other cases show substantial discrepancies between the official figures and survey-based estimates. In Kerala the survey-based estimate is almost twice the official estimate, and in West Bengal, Andhra Pradesh, Gujarat, and the Union Territory of Delhi, the CPR is higher than CEP values by 57, 28, 26, and 50 percent respectively. In all the other states and union territories the survey-based estimates of CPR are systematically higher than the official CEP values. Thus until 1980 the official estimates of CEP seem to have underestimated the use of modern method of contraception in most states.

In 1988 while the survey-based estimate of contraceptive use (CPR) and the official estimate (CEP) agree remarkably well at 39.9 percent at the all-India level, substantial discrepancies emerge at the state level. In Goa, Jammu and Kashmir, Kerala, the northeastern states, West Bengal, and the union territories of Delhi and Chandigarh, the official figures (CEP) seem to have underestimated actual use as reported in the survey (CPR) by more than 20 percent. The maximum discrepancy in actual use is observed in Goa (56 percent), Kerala (38 percent), Delhi (62 percent), and Chandigarh (59 percent). On the other hand in Gujarat, Haryana, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh, and the Union Territory of Pondicherry, the survey-based estimates of CPR are lower than official CEP values implying the possibility of overestimation of contraceptive use in the official records in these states. Further the use of traditional methods of contraception seems to be substantially high (over 20 percentage points in CPR) in Assam, Goa, Kerala, the

Table 5.8 Current Use of Contraception According to ORG Survey (CPR) and Government of India (CEP) and Related CBR Values: India, 1980 and 1988

State	1980			1981 SRS	1988			1989 SRS
	All Methods	Modern Methods			All Methods	Modern Methods		
	CPR	CPR	CEP	CBR	CPR	CPR	CEP	CBR
Andhra Pradesh	34.4	32.7	25.6	31.3	50.3	43.5	39.0	25.6
Assam	NA	NA	19.3	33.0	43.1	29.6	26.2	29.1
Bihar	20.3	15.0	12.4	38.1	30.7	24.8	22.9	34.4
Goa	NA	NA	16.3	18.3	60.5	43.0	27.6	15.5
Gujarat	44.7	39.3	31.3	34.8	56.2	47.6	53.2	28.7
Haryana ^a			29.1	36.8	53.1	51.6	56.4	34.8
Himachal Pradesh	47.0 ^b	33.8 ^b	24.4	32.0	52.9	50.8	44.6	27.7
			(16.6) ^b	(33.1) ^b				
Jammu & Kashmir			11.0	31.2	40.6	38.4	21.3	30.7
Karnataka	30.1	26.5	22.3	27.9	47.5	44.5	42.3	27.9
Kerala	60.6	56.4	28.9	26.2	80.1	64.0	46.4	19.8
Madhya Pradesh	28.0	25.8	21.7	37.7	39.4	38.6	36.2	35.1
Maharashtra	42.7	38.9	34.5	29.1	54.7	53.4	54.7	28.3
NE States ^c	NA	NA	NA	NA	40.0	26.2	15.3	26.2
Orissa	39.6	25.7	26.9	32.7	45.3	40.6	37.8	30.2
Punjab	49.4 ^a	37.5 ^a	23.5	30.2	69.3	65.9	68.2	28.4
			(25.9) ^a	(31.5) ^a				
Rajasthan	22.2	19.8	13.3	37.9	30.0	28.8	27.9	33.9
Tamil Nadu	45.2	26.2	28.2	27.8	59.3	46.8	52.6	23.1
Uttar Pradesh	24.7	18.0	11.5	39.2	28.3	24.9	28.8	37.0
West Bengal	48.8	33.2	21.4	32.4	54.8	40.3	31.3	26.9
Delhi	63.5	52.1	34.8	28.0	69.3	64.4	39.8	22.5
Chandigarh	NA	NA	NA	NA	71.3	61.6	38.8	22.5
Pondicherry	NA	NA	NA	NA	67.5	56.1	58.2	21.0
India	35.3	28.2	22.3	33.8	44.9	39.9	39.9	30.5

^aCombined estimates of Punjab and Haryana for 1980 given against Punjab

^bCombined estimates for Himachal Pradesh and Jammu and Kashmir for 1980 given against Himachal Pradesh.

^cCombined estimates for Arunchal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim, only for 1988

Notes: CBR = crude birth rate; CEP = effective couple protection rate from government service statistics; CPR = contraceptive prevalence rate from ORG Survey; SRS = Sample Registration System

Source: India, Ministry of Health and Family Welfare, Department of Family Welfare, 1991; Operations Research Group, 1971, 1983, 1990

northeastern states, Tamil Nadu, West Bengal, and Pondicherry--all with a substantial proportion of Roman Catholics.

On the whole the 1988 survey reveals that the practice of contraception is extremely high in Kerala with more than 80 percent of couples practicing family planning. Use is also quite high, over 55 percent, in four states and the three union territories. Only in the four large Hindi-speaking states in northern India, which comprise over 40 percent of India's population, are contraceptive use rates lower than 40 percent.

The secular trends in CPR by selected population or couple characteristics as obtained from the three surveys reveal some interesting findings (Table 5.9). The practice of contraception increased significantly among married women under 30 between 1970 and 1988; for example, use at age 25-29 rose almost 30 percentage points. Almost two-thirds of those protected in this age group in 1988 were sterilized. Similarly, the proportion practicing contraception among those couples with only two surviving children increased dramatically by 35.5 percentage points in that period. Even among couples with no surviving sons, 17.3 percent reported using contraception in 1988--noteworthy in a population that places enormous value on the male child.

Similarly, rural-urban differentials in contraceptive use are also narrowing with two-fifths of rural couples practicing contraception in 1988. By religious denomination, practice is high among Hindus, Sikhs, and Christians, but it is notable that a third of India's Muslims reported use of contraception in 1988--higher use rates than in the neighboring Islamic countries of Bangladesh and Pakistan. Similarly, contraceptive use is becoming increasingly prevalent among scheduled castes and tribes,¹ among couples with illiterate spouses, and among couples with a low monthly income. Thus, a contraceptive revolution of a historically unprecedented magnitude (with the possible exception of China's) is taking place in India. In Figure 5.8 we see the pattern of family planning practice in 1988 according to the number of surviving sons. Although the percentage of couples using family planning methods increases with the number of surviving children, the increase is larger if there are more boys than girls. Among couples with two children, the proportion using contraception is 58 percent if both are sons, 47 percent when only one is a son, and 35 percent if both are daughters. The last figure is indicative of a revolutionary social change in a society which has placed enormous value on a male child.

¹ In India's hierarchical caste system, some castes are considered extremely backward--the rest of society calls them untouchables. After independence in 1947, to improve these groups' socioeconomic conditions, the government identified many castes in a schedule and gave special preference to them in admission to schools, employment, and politics; these are thus scheduled castes. Similarly, groups living in hilly or interior areas that have been singled out for such privileges are termed scheduled tribes.

Table 5.9 Contraceptive Prevalence Rate and Share of Sterilization Acceptors by Selected Characteristics of Couples: India, 1970-88

Characteristics	CPR from All Methods			Percentage Share of Sterilization
	1970	1980	1988	1988
All Couples	13.6	35.3	44.9	69.7
Age of Wife				
15-19	6.8 ^a	5.7	8.6	8.1
20-24		16.0	23.1	36.4
25-29	13.5	32.0	43.3	63.7
30-34	17.3	44.7	57.6	73.6
35-39	17.8	52.1	65.2	78.4
40-44	16.5	47.0	59.5	85.7
Surviving Children				
0	2.4	3.6	4.6	10.9
1	7.1	16.9	23.8	19.3
2	12.5	33.6	48.0	59.4
3	15.7	49.4	60.5	79.3
4	18.1	54.0	62.1	83.1
5+	24.6	51.0	55.1	81.7
Surviving Sons				
0	5.3	11.0	17.3	32.9
1	12.1	34.0	43.4	59.2
2	18.8	51.0	64.1	80.5
3	20.2	54.7	61.9	84.0
4+	24.0	50.7	58.4	80.0
Residence				
Rural	10.6	31.3	40.7	74.7
Urban	27.0	50.7	57.6	58.9
Religion				
Hindu	13.8	36.1	45.5	71.6
Muslim	8.8	22.5	33.8	57.4
Sikh			63.2	49.5
Other	24.8 ^b	48.0 ^b	58.7	61.8
Caste				
SC/ST	NA	29.9	37.5	74.1
Other low castes	NA		47.4	74.9
Upper castes	NA	37.7 ^c	51.8	63.1
Wife's Education				
Illiterate	10.0	28.4	36.6	79.5
Primary	20.7	46.8	54.1	73.0
Secondary	33.5	53.4	57.7	61.9
Higher level	56.2	62.0	63.6	39.8
Monthly Family Income				
Up to Rs. 500	12.4	31.6	40.6	77.8
501-1000	28.6	42.6	42.2	71.3
1001+	39.2	56.2	55.0	58.5

^a = ages 15-24

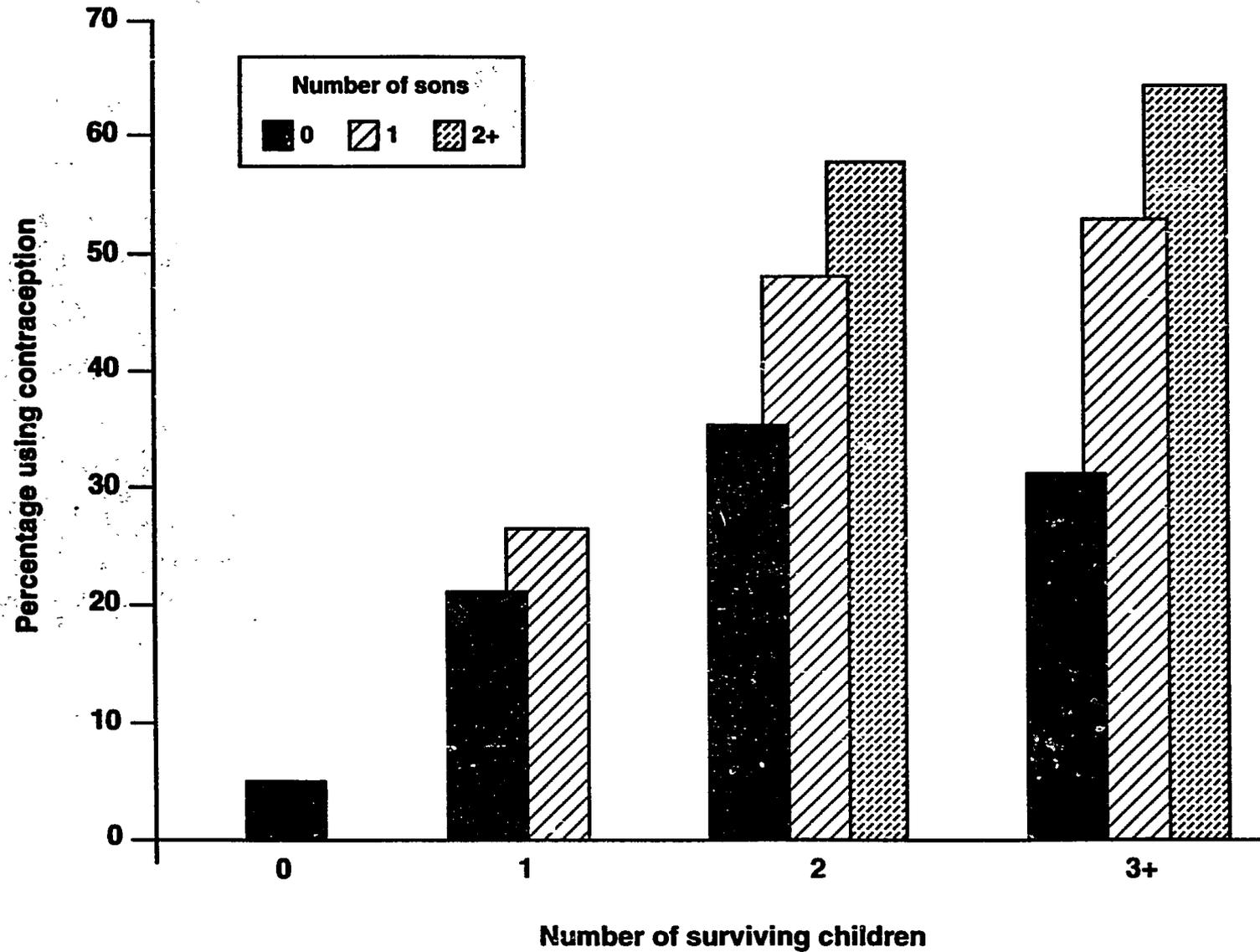
^b = Sikhs and others

^c = Other low and upper castes

Notes: NA = not available; SC = scheduled castes; ST = scheduled tribes

Source: India, Ministry of Health and Family Welfare, Department of Family Welfare, 1991; Operations Research Group, 1971, 1983, 1990

Figure 5.8
Contraceptive Prevalence Rate by Numbers of Surviving Children and Surviving Sons
India: 1988



There is no doubt that use of modern contraception will become universal in India, cutting across literacy, income, castes, religion, and other social characteristics once considered barriers in the adoption of small family norms. But large differentials among states remain, and generally, the large Hindi speaking states of North India lag behind the rest. What can accelerate the spread of contraceptive use in those areas where the pace of change is slow? What lessons can be drawn from the successful experiences of some states in the south and west? These questions will be addressed in the following chapters.

Estimates of crude birth rates for 1981 and 1989 for states and union territories for which data were available can be expected to be influenced by 1980 and 1988 levels of contraceptive use (Table 5.8). We can use this data set to examine the relationship among CPR, CEP, and CBR values using the states and union territories as units of analysis.

When we add traditional methods to modern methods and take the combined CPR obtained from the ORG Survey in 1980 and 1988 and relate them to the appropriate CBR values, we find that the regression equations of CBR on CPR and the R^2 values for 1980 and 1988 are almost identical as follows:

$$Y = 42.02 - 0.24 X \text{ and } [R^2 = 0.54] \quad (N = 15) \quad (1)$$

where Y is CBR of 1981 and X is CPR by all methods in 1980

$$Y = 42.47 - 0.28 X \text{ and } [R^2 = 0.55] \quad (N = 22) \quad (2)$$

where Y is CBR of 1989 and X is CPR by all methods in 1988.

Adding traditional methods of contraception to the CPR values in the regression above may tend to inflate the strengths of association between CBR and CPR values, possibly because of probing survey questions on possible use of any contraception to account for longer inter live birth intervals and open birth intervals (interval since the last birth to the date of survey) among couples who report no use of modern methods of contraception. One can always attribute longer birth intervals, closed or open, to sexual abstinence or the rhythm method. When we analyze the relationship between CBR and CPR values in Table 5.8, confining the CPR only to modern methods the regressions and R^2 values are as follows:

$$Y = 40.77 - 0.26 X [R^2 = 0.50] \quad n = 15 \quad (3)$$

where Y is the CBR of 1981 and X is CPR due to modern methods in 1980 and

$$Y = 37.29 - 0.21 X [R^2 = 0.25] \quad n = 22 \quad (4)$$

where Y is the CBR of 1989 and X is CPR due to modern contraception in 1988.

Similarly if we regress the CBR values with CEP as obtained from the service statistics, we get still lower statistically nonsignificant R^2 values and the following regressions:

$$Y = 42.34 - 0.42 X [R^2 = 0.55] \quad n = 15 \quad (5)$$

where Y is CBR for 1981 and X is the CEP of 1980 and

$$Y = 30.57 - 0.07 X [R^2 = 0.03] \quad n = 22 \quad (6)$$

where Y is the CBR of 1989 and X is the CEP of 1988.

In the last case X and Y seem to be practically uncorrelated.

From the analyses above we can draw the following conclusions:

1. The explanatory power of contraceptive use on fertility (CBF) declined between 1980 and 1988.
2. Adding the use of traditional methods of contraception to use of modern methods and considering total use explains a greater proportion of variance in the crude birth rate (54 percent as compared to 50 percent in 1981 and 50 percent as compared to 25 percent in 1989).
3. The R^2 values of fertility with contraceptive use as estimated from the official records seem to be quite low in 1989 and close to zero.

In other words, the CEP has, in recent years, become a measure almost irrelevant to assessing the impact of contraceptive use on fertility.

EFFECT OF FAMILY PLANNING PROGRAM COMPONENTS ON ACCEPTANCE AND USE

A country's commitment to demographic goals, the family planning program, and the way it is implemented determine, to a significant extent, the rates of acceptance and use of family planning methods in the population. Programs with strong national political commitment, an efficient bureaucracy, a service delivery system that makes modern contraceptive methods easily accessible and readily available to couples; sound information, education, and communication strategies, and good record-keeping and monitoring systems have higher acceptance and use rates. Statistically, significant effects have been observed by good programs, even in rural, economically backward, and largely illiterate populations.

India launched her official family planning program in 1952, as part of its First Five-Year Plan. In the past 40 years, the program has expanded considerably through the extension of a network of rural and urban maternal and child health services and medical facilities that also offer family planning services. The total number of service delivery units or facilities--rural primary health centers and subcenters and urban family welfare centers and hospitals--was over 150,000 in March 1991. An estimated 300,000 personnel receive their salaries from the family welfare budget. Almost every Indian village and urban area has now been covered with family planning education, supplies, and services through a network of primary health centers (PHCs) and urban welfare centers.

As of March 1990, 55.5 billion rupees (about U.S. \$4.6 billion at the 1981 exchange rate, which represents the rate at the median year) had been expended since the program's inception. Nevertheless, despite the intensity of national efforts, the program's impact on fertility is rather disappointing compared to achievements in other countries. The effective couple protection rate (CEP) had increased to only 43 percent of eligible couples as of March 1990, and fertility had declined less than what was anticipated in every five-year plan. From 1977 to 1988, the crude birth rate has stagnated at around 33 per 1,000 population per year. Many Asian countries that launched family planning programs much later than India--such as

Korea, Indonesia, and Thailand--have achieved higher CPRs and larger fertility declines. Efforts to understand the reasons for the tardy success of family planning in selected states may help identify factors that are easily manipulable and implement measures to improve program effectiveness and efficiency.

One important observation on the Indian scene is that substantial interstate and interdistrict variations continue to exist in the CPR and in fertility. Even in 1990, there were districts in almost every state with a CPR over 50 percent--a level targeted for the country as a whole by 1995-2000--and at the same time districts with a CPR under 40 percent in many states. Similarly, there were districts with a total fertility rate (TFR) of near 2.5 live births per woman and some with a TFR of over five births per woman in most states. The interstate differentials seems to be more dominant and striking than the interdistrict differentials within a state. As the CPR level increases and fertility declines, the districts tend to become more and more homogeneous. Let us try to understand why there is a greater degree of heterogeneity between states.

The basic administrative units for delivering family planning services in rural areas in India are the primary health centers or PHCs. Following a nationally set pattern, personnel and facilities are supposed to be deployed uniformly at the PHC level within each state, mainly based on their population size, although there is some variation between states.² Inputs into the centrally funded program are supposed to be uniform. Why, then, should there be such a high degree of variation in family planning acceptance among the districts and PHCs within a state?

First, despite government intentions, provision of facilities and personnel is not uniform in all PHCs (Khan et al., 1988). There are differences between the states. Medical and paramedical positions in PHCs often go vacant for long periods, and the supply of essential materials may be inadequate. It is not clear if variations in the availability of personnel and materials are wholly responsible for differentials in program performance at the PHC level. Little is known about the relationship between program input and performance; the findings of research on the topic could help decision makers deploy additional resources or manage existing resources better to achieve an optimal acceptance rate.

Second, variation in program performance may also depend on political will and commitment to the program and the efficiency with which inputs into the program are used

² PHCs provide curative, preventive, and promotive health services to rural Indians. They were originally intended to serve populations of 80,000-100,000; however, since 1978, the government has moved to strengthen the rural health infrastructure by establishing one PHC for every 30,000 population (or one per 20,000 in hilly, tribal, or backward areas). However, progress in achieving this goal has been uneven. Maharashtra has been fairly successful in establishing PHCs at a rate of one per 30,000, but Tamil Nadu and West Bengal persist in having PHCs cover populations of nearly 100,000; the situation in Karnataka lies somewhat between them. See Glossary for functionaries.

to advance its goals. Good management of available resources can be a key to program success and may vary from state to state.

Third, variation in program performance at the PHC level may also be affected by the overall socioeconomic development of the region. In more developed areas, people may demand health and family welfare services of their own volition. If the availability of any given component is drastically influenced by social, economic, and cultural conditions, program strategy may require reorganization.

Key family planning program components are also believed to contribute substantially to increased contraceptive practice and therefore to reduced fertility. Lapham and Mauldin's (1985) study of the influence of family planning program effort on CPRs and fertility in 93 developing countries between 1965 to 1980 using countries as units of analysis, concluded that program effort had an independent and significant impact on fertility. Hernandez (1984) presents a demographic approach for estimating the net program effect, countrywide, for Costa Rica, Mauritius, South Korea, and Taiwan. Identifying program components that affect family planning performance may provide useful guidelines for improving program strategies in India.

Some evaluation studies on the efficacy of the Indian family planning program conducted by Mishra and colleagues (1982) observed that the functioning of the Indian family planning program was greatly influenced not only by the nature of the bureaucracy of the central and state health ministries but also by the state's political climate and socioeconomic and cultural conditions. After an analysis of program activities in Goa, Maharashtra, and Tamil Nadu, Antony and colleagues (1989) concluded that the three major determinants of success in family planning performance were political support, program efficiency, and socioeconomic environment; they argued that to achieve rapid fertility declines, at least one of these factors must be highly conducive to and supportive of family planning activities. Detailed case studies of three selected states are presented in Chapter 7.

In recent years, there has been much discussion in the family planning field about strategic management and quality of care. Strategic management is felt to comprise an appropriate political environment, program strategy and process, and quality of care to acceptors, thought to be reflected in the method mix and in follow-up services (Ness, 1989). Rushikesh Maru (1989) has commented that in India, a highly bureaucratic program structure is conducive to achieving one-time performance (such as meeting sterilization targets), but its success in providing methods that require follow-up care is limited. In fact, the most pertinent question in the Indian program is how to overcome this bureaucratic weakness so that the program can offer a wider range of methods and good follow-up care for acceptors of spacing methods. Jain (1989) observed that monitoring continuation rates alone is

inadequate in identifying strengths and weaknesses, and that guided management toward program improvement is required instead.

In this context it appears relevant to draw lessons from a large-scale study undertaken recently to investigate the relationship between program inputs and acceptance of methods in rural areas at the PHC level in four states (Srinivasan et al., 1991). An attempt was made to ascertain the association of various program input factors in these four states with family planning acceptance in the same period. The objective was to study interrelationships between program components and socioeconomic conditions of the population in which they are deployed, and to measure the impact of family planning program input on contraceptive acceptance. The major findings seem relevant and useful.

PROGRAM IMPACTS AND ACCEPTANCE: FINDINGS FROM A FOUR-STATE STUDY

Methodology

The study was conducted in Karnataka, Maharashtra, Tamil Nadu, and West Bengal in 1988. The CPR varied substantially in these states, from 30 percent in West Bengal to 55 percent in Maharashtra. Since PHCs are expected to maintain records on program input and performance, necessary data were compiled through a structured questionnaire administered to each PHC medical officer. The data collected included background characteristics of the PHC--size of the population served; number of subcenters and their distances from the PHC; number of villages served and length of time the center had been functioning; family planning program resources, including medical and paramedical personnel (both in position and sanctioned), their training, and availability of medical and service-related facilities; acceptance rates of four official methods of family planning (sterilization, IUD, condom, and the pill); and PHC functions and activities, including budget, incentives, maternal and child health (MCH) services, and input from medical officers for program improvement. Information on selected socioeconomic and demographic characteristics at the district level was also compiled from the 1981 censuses of these four states.

See Table 5.10 for characteristics of the four states, the number of PHCs in each, and the number for which information was received. Since these are four of the relatively good performers, they give an idea of the pattern of MCH and family planning services in the country. Of 2,510 PHCs in the four states, data were compiled from 2177 centers or 87 percent, with this proportion ranging from 84 percent in Maharashtra to 95 percent in Tamil Nadu.

Table 5.10 Basic Demographic and Family Planning Program Characteristics: Four States, India, 1984-91

Characteristic	State			
	Karnataka	Maharashtra	Tamil Nadu	West Bengal
1991 population in millions ^a	44.8	78.7	55.6	68.8
% of population in urban areas, 1991 ^a	71.1	65.0	67.0	73.5
% literate among women 7+, 1991 ^a	28.0	35.0	35.0	33.0
Per capita net domestic product at 1984 prices (Rs.) ^a	2136.0	3430.0	2353.0	2813.0
Total fertility rate, 1984 ^b	3.8	3.8	3.3	3.9
Life expectancy at birth--both sexes, 1984 ^c	62.0	61.0	58.0	56.0
Couple protection rate, March 1987 ^a	39.7	54.9	46.3	29.5
No. of primary health centers (PHCs) ^a	465.0	1378.0	382.0	285.0
% of PHCs reporting ^a	88.2	84.2	94.5	86.3

Sources: ^aIndia, Ministry of Health and Family Welfare, Department of Family Welfare, 1991, Tables A.2.2., C.2.1, C.8, and E.2; ^bIndia, Registrar General, 1986, statement 25, p. 43; ^ccomputed from Parsuraman, 1987

Based on information collected from these sources, the following variables were used in analyzing interrelationships:

- **Family planning program performance measures:** average number of sterilizations per 1000 population per year (April 1, 1984, to March 31, 1987) in a PHC area; and average number of IUD insertions per 1000 population per year (April 1, 1984, to March 31, 1987) in a PHC area.
- **Family planning program input measures**

Personnel: number of doctors per 100,000 population in a PHC area; whether the PHC has at least one medical officer trained in laparoscopy or tubectomy (no = 0; yes = 1); number of female paramedics per 100,000 population in the PHC area;³ and number of trained dais (traditional birth attendants) per 1000 population in the PHC area.

Medical, service, and other facilities: whether the PHC has an operating theater (no = 0; yes = 1); whether the PHC has adequate medical facilities (no = 0; yes = 1);⁴ whether the PHC has adequate service-related facilities (no = 0; yes = 1);⁵ whether at least one doctor is staying in the staff quarters or in the PHC area (no = 0; yes = 1); and whether the PHC has at least one vehicle in working condition (no = 0; yes = 1).

Incentives: whether the PHC offers incentives other than those provided through the official government program (no = 0; yes = 1).⁶

- **Socioeconomic measures:** percentage of literate women and percentage of never-married women aged 15-19 in rural areas of the district; percentage of the district's population that is rural; percentage of the district's rural male population engaged in nonagricultural work; percentage of scheduled castes; and percentage of Muslims in the district's rural population.

Data on the input variables were compiled for each PHC in the four states.

Information on the number of family planning acceptors was compiled from PHC

³ Only female paramedics such as auxiliary nurse-midwives and public health nurses are included in the present analysis, because their role has become more crucial in recent years in promoting program performance. In addition, Tamil Nadu (and, to some extent, in Maharashtra), exact information on the number of male paramedics at the subcenter level was not uniformly provided because of administrative difficulties, so information on male paramedics is excluded from this analysis.

⁴ Information was compiled on seven medical facilities deployed in a PHC: a ward; a dispensary; a laboratory; a labor room; abortion services; thermocol boxes (which let health workers transport vaccine at a specified temperature); and a sterilizer. A PHC was considered to have adequate medical facilities if it had any six of these resources and inadequate if it had fewer than six.

⁵ The measure of service-related facilities consists of five items: waiting space; a doctor's room; a toilet; a cupboard; and electricity. Facilities were considered adequate if any four of these were present and inadequate if under four were available.

⁶ While there is a standard incentive payment for acceptors of various methods Rs. 150 (about US \$9), to a man who became sterilized, and Rs. 195 (about US \$12) to a woman who became sterilized, PHCs may pool incentives (in cash or kind) from other sources, such as government organizations, voluntary organizations, and other local bodies.

service statistics. The acceptance rate was computed using information on the rural population of the PHC area, drawn from census records. The socioeconomic variables (dating from 1981) for each PHC are district-level figures because no such data are available for the PHC populations.

PHC family planning performance was assessed only in terms of sterilization and the IUD for three reasons: (1) particularly in rural areas, sterilization continues to be the most popular contraceptive method, used by the majority of the population; (2) the IUD (especially the Copper-T) has been systematically promoted by the program since 1981; (3) statistics on other methods, such as condoms and the pill, are of poor quality.

RESULTS

Program input and socioeconomic conditions

Table 5.11 presents the levels of program input and performance for each of the four states, classified according to the PHC district's level of socioeconomic development.⁷

Maharashtra, the only state with a PHC for every 30,000 people, leads in providing medical and paramedical personnel to its rural population. The 6.5 physicians per 100,000 population comes close to the PHC standard of two medical officers per 30,000 population. Maharashtra's average of 34 paramedics per 100,000 people nears the expectation of the average PHC serving 30,000 having about ten paramedics.⁸ Three-fourths of its PHCs had the services of a medical officer trained in laparoscopy or tubectomy.

In the other three states, the number of workers available to rural residents was well below the prescribed standard. In Tamil Nadu and West Bengal, where each administrative health unit still covers about 100,000 people, the ratios of doctors and paramedics to population are inadequate. The scarcity of doctors is most apparent in Tamil Nadu, where there were fewer than three doctors per 100,000 population and only a third of PHCs had doctors trained in laparoscopy or tubectomy. West Bengal is most lacking in paramedical

⁷ Using data for five socioeconomic indicators (the percentage of women who are literate, the proportion of 15-19 year-olds who are single, the percentage of males engaged in nonagricultural work, and the percentage of Muslims in the 1981 census), composite score was calculated for each district in a state by pooling the ranks given to the five variables. The distribution of the composite score was then partitioned equally into three parts: districts with a composite score above the 67 percent cutoff were classified as high socioeconomic status; those with a composite score between 33 and 67 percent were classified as medium; and those with a score below 33 percent were classified as low socioeconomic status.

⁸ The standard number of paramedical personnel per PHC is based on the size of the population to be served. A PHC with 30,000 people is supposed to have six auxiliary nurse-midwives and a supervisor for every four nurse-midwives. In addition, each PHC has one other female paramedic and a public health nurse making a total of about ten female paramedics per PHC.

Table 5.11 Mean Value of Program Input and Performance, by Component, According to State and Level of Socioeconomic Development among PHCs, India, 1985-87

Program Input & Performance Components	State and Socioeconomic Level															
	Karnataka				Maharashtra				Tamil Nadu				West Bengal			
	All	High	Med	Low	All	High	Med	Low	All	High	Med	Low	All	High	Med	Low
Program Input in PHC Area or PHC																
No. MDs/100,000 in area	3.09	3.06	3.09	3.10	6.52	7.02	6.40	5.73	2.78	2.91	3.06	2.40	3.78	4.13	3.72	3.72
No. paramedics/100,000 in area	28.2	34.2	28.3	25.1	33.7	36.2	31.2	32.5	25.3	28.6	23.2	25.8	23.6	24.1	23.6	23.1
PHC has at least 1 MD trained in laparoscopy or tubectomy	0.64	0.60	0.66	0.64	0.75	0.72	0.77	0.78	0.38	0.36	0.31	0.47	0.74	0.69	0.76	0.74
No. trained dais per/100,000 in area	0.79	0.89	0.84	0.70	0.91	0.98	0.84	0.90	0.90	0.83	0.89	0.94	0.80	0.85	0.72	0.89
At least 1 MD stays in staff quarters or PHC area	0.89	0.91	0.87	0.89	0.78	0.75	0.80	0.79	0.96	0.96	0.97	0.95	0.95	0.97	0.96	0.92
PHC has operating room	0.65	0.72	0.66	0.60	0.59	0.56	0.56	0.69	0.85	0.78	0.88	0.84	0.59	0.46	0.56	0.71
PHC has at least 1 working vehicle	0.88	0.87	0.85	0.92	0.88	0.87	0.87	0.92	0.98	0.99	0.97	0.99	0.56	0.67	0.53	0.54
PHC has adequate medical facilities	0.69	0.76	0.71	0.65	0.21	0.23	0.21	0.20	0.54	0.49	0.56	0.56	0.41	0.49	0.37	0.44
PHC has adequate service facilities	0.77	0.80	0.79	0.73	0.61	0.63	0.57	0.63	0.92	0.95	0.91	0.92	0.33	0.26	0.30	0.42
PHC offers additional incentives	0.57	0.65	0.54	0.57	0.51	0.52	0.51	0.50	0.24	0.18	0.18	0.36	0.06	0.08	0.06	0.04
Program Performance in PHC/1000 (1984-87)																
Avg. annual no. sterilizations	9.20	8.80	9.33	9.28	9.92	10.46	9.92	8.88	6.02	6.41	5.13	6.83	5.34	5.70	5.27	5.26
Avg. annual no. IUD insertions	4.65	5.01	4.68	4.43	10.05	9.55	9.87	11.31	2.53	3.56	2.44	2.05	1.15	1.18	1.10	1.23

Source: Srinivasan et al., 1991

personnel (with 24 per 100,000 population), with Tamil Nadu a close second (25 per 100,000).

In Maharashtra, more than 94 percent of PHCs reported having at least 75 percent of the expected number of paramedics available (not shown in the table); this proportion was 80 percent in West Bengal, with the other two states falling between them. In all four states, there was a significant positive correlation between the numbers of doctors and paramedics per 100,000 population: the higher the number of doctors in a PHC, the greater the chance that there was a relatively large number of paramedics, and vice versa. This may appear to be the logical result of the deployment of personnel, but the lack of doctors and paramedics in some PHCs represents a major problem; except in Maharashtra, the proportion of such PHCs is likely to have been sizable. All states have made satisfactory progress in meeting the national standard of one dai per 1000 population in rural areas, although none has really achieved the target.

Nearly all PHCs in Tamil Nadu and West Bengal provided housing for at least one doctor. In Maharashtra a doctor was living in official housing in only three-fourths of PHCs. The number of PHCs in Maharashtra has swelled in recent years because many of its subcenters were converted into PHCs by the addition of doctors and paramedics, but the state appears to have had problems coping with the need to provide residential facilities.

Facilities such as an operating theater and a working vehicle were available in the greatest proportion of PHCs in Tamil Nadu. In the other three states, an operating theater was available in fewer than two-thirds of the PHCs. One roadworthy vehicle was available in slightly over four out of five the PHCs in West Bengal.

The Tamil Nadu program seems to have emphasized the provision of physical facilities, although in terms of personnel it has lagged considerably. The situation in Maharashtra, is the opposite, with most PHCs having adequate personnel but the absence of adequate medical facilities was particularly evident: not even a fourth of PHCs reported having them. One wonders about the quality of PHC services if it lacks even basic medical facilities. Service-related facilities were extremely unsatisfactory in West Bengal, and less than ideal in Maharashtra and Karnataka. The latter two states were most likely to have PHCs that offered incentives beyond those routinely provided by the family planning program; PHCs in Tamil Nadu were less likely to do so and those in West Bengal generally did not.

A comparative analysis of input in the four states, according to prevailing socioeconomic conditions in the PHC's service area, reveals that within each state, the distribution of most program components considered in Table 5.11 was not greatly influenced by socioeconomic climate. However, an interesting interstate variation emerges regarding deployment of a few of these components. For example, in West Bengal, a significantly higher proportion of PHCs in areas of low socioeconomic development had an operating

theater and adequate service-related facilities than did PHCs in more highly developed areas; in the other three states, there were few socioeconomic differences in the deployment of these facilities. In Tamil Nadu, PHCs in areas of low socioeconomic development were more apt to have met the target for trained dais and to have at least one doctor trained in sterilization procedures than were PHCs in more developed areas.

About 40 percent of PHCs in less developed areas of Tamil Nadu offered additional incentives to family planning acceptors, compared with under 20 percent of PHCs in high- and medium-development areas. Elsewhere, extra incentives were offered uniformly in all PHCs; in fact, in Karnataka and Maharashtra, the majority of the input at the PHC level seemed to be distributed regardless of local socioeconomic development. For example, the average number of doctors in Maharashtra PHCs of higher socioeconomic development was 7.6 per 100,000 population, compared with 6.9 per 100,000 in areas of medium development and 6.1 per 100,000 in areas of low development; in Karnataka, the respective rates were 3.0, 3.3, and 3.1.

Thus, distribution of family planning program components in PHCs appears to be related to local socioeconomic development only with regard to facilities (an operating theater, medical and service-related facilities) and incentives. This finding suggests that except for a few components in West Bengal and Tamil Nadu, there has been no selective input to socioeconomically deprived areas. If we assume that such areas are likely to have fewer nongovernmental medical and paramedical facilities, then increased investment of public resources on medical and other facilities must compensate for this deficiency. Program managers planning to deploy resources into rural areas should probably note socioeconomic conditions, rather than simply considering population size.

Program Performance and Socioeconomic Conditions

As with program input, there were striking variations in the acceptance of sterilization and the IUD in the four states. For example, the average acceptance rates for sterilization and the IUD in Maharashtra were about even and well above West Bengal's. Except in Maharashtra, IUD acceptance was much lower than sterilization acceptance.

Socioeconomic differentials in accepting sterilization and the IUD were most striking in Maharashtra and Tamil Nadu. Contrary to general expectations, these associations varied in direction: in Maharashtra, sterilization acceptance rose with socioeconomic development (from 8.9 per 1,000 in low socioeconomic status (SES) areas to 10.5 per 1,000 in high-status areas), while IUD acceptance was higher in low-SES areas (11.3 per 1,000) than in high-SES areas (9.6 per 1,000). In West Bengal and Karnataka, on the other hand, there was little variation in program performance according to socioeconomic development.

Impact of Program Inputs on Family Planning Acceptance

The most interesting and probably instructive finding from the study is the nature of association found between the program input factors described above and family planning acceptance. The multivariate analysis carried out on this large body of data appears in Table 5.12. Among the four states, the percentage of variance in sterilization acceptance explained by program input factors and socioeconomic variables was the maximum of 35 percent ($R^2 = 0.35$) with other states much less; West Bengal, 33 percent; Maharashtra, 20 percent; and Tamil Nadu, only 9 percent. The amount of variance in IUD acceptance explained by these predictors was generally in the same direction but slightly lower. The effect of any given individual factor on acceptance varies from state to state. For example, adding a second doctor to the PHC did not increase sterilization acceptance in Maharashtra, but increased it by 1.5 sterilizations per thousand population per year in Karnataka and about one in Tamil Nadu and West Bengal.

The effect of any input variable in the family planning program on acceptance levels seems to be influenced by the state in which the input is given. There is a dominating "state effect" influencing the effect of any program factor. For example, the number of doctors trained in sterilization techniques at the PHC level had a greater impact than the number of paramedics in Karnataka and Maharashtra while in West Bengal, the number of paramedics had a greater effect than the number of trained doctors. Similarly, the effects of socioeconomic and structural covariates differ by state, suggesting the effect of any program input or socioeconomic variables depends largely on the state where the input is deployed and the social changes occur.

In India, family planning program implementation is largely the responsibility of the state governments, although financial resources come from the central government. The state's organizational efficiency and the political commitment to the program determine to a large extent, the structure and effectiveness of any family planning input. The four states studied in 1987 differ widely in the political parties that were in power during the study period--the Marxist Party (for over a decade in West Bengal), the Dravida Munnetra Kazhagam Regional Party or its offshoot for over two decades in Tamil Nadu, the Congress Party in Maharashtra, and the Janata Party in Karnataka during the study period. Each political party placed different emphasis on the family planning program although all programs were funded by the central government. For instance, there has been a strong commitment to small family norm in Tamil Nadu by the regional party for over four decades. Under strong political commitments, various government resources, in addition to those from the Health and Family Planning Department, tend to be used for motivation, education, and organization of camps and services. When a family planning camp is

Table 5.12 Effect of Different Program Input Factors at PHC Level on Sterilization Acceptance, Based on Multiple Classification Analysis: Four Indian States, 1985-87

Variable & Level	Adjusted Mean No. Sterilizations* & β Values			
	Karnataka	Maharashtra	Tamil Nadu	West Bengal
No. MDs	$\beta = .26$	$\beta = .90$	$\beta = .10$	$\beta = .11$
0	8.18	3.48	5.49	4.97
1	8.81	10.59	5.79	5.28
2	10.35	10.59	7.03	5.20
No. Paramedics	$\beta = .13$	$\beta = .09$	$\beta = .08$	$\beta = .27$
0	8.86	9.86	5.46	4.75
1	8.73	10.10	6.15	4.93
2	9.85	11.52	6.71	6.35
No. Dais	$\beta = .06$	$\beta = .13$	$\beta = .06$	$\beta = .06$
0	8.86	9.56	6.15	4.95
1	9.12	9.88	5.53	5.25
2	9.46	12.22	6.71	5.81
At Least 1 Trained MD	$\beta = .05$	$\beta = .04$	$\beta = .02$	$\beta = .01$
0	9.29	10.73	6.26	5.36
1	8.88	9.86	6.02	5.27
Adequate Medical Facilities	$\beta = .04$	$\beta = .30$	$\beta = .01$	$\beta = .15$
0	9.06	15.09	6.16	5.78
1	9.39	9.11	6.05	4.98
Adequate Service Facilities	$\beta = .12$	$\beta = .05$	$\beta = .10$	$\beta = .04$
0	9.38	10.81	5.91	5.51
1	8.23	9.97	8.44	5.26
At Least 1 MD Staying in the PHC	$\beta = .01$	$\beta = .08$	$\beta = .04$	$\beta = .01$
0	9.14	10.88	6.06	5.34
1	9.27	9.12	8.00	5.26
Total Variance Explained by All Factors Above & Covariables 100R²	35.0	20.0	8.7	32.5

*Per 1000 population per year

Source: Srinivasan et al., 1991

organized in Tamil Nadu, the services of government personnel from other departments such as education and revenue are also used. Under such circumstances one cannot expect a high correlation coefficient between direct program inputs and acceptance when inputs from other departments are used differently from state to state.

The explanatory power of all the program input factors considered in this study is least understood in explaining variations in acceptance of methods in Tamil Nadu. But this state has performed admirably in family planning, probably second next to Kerala, reaching a TFR of 2.4 in 1990. In this state political commitment to the small family norm has been consistently strong; the bureaucracy functions with a fair degree of efficiency; and different departments of the government other than health and family planning have been involved in family planning motivation activities. Hence, though the direct effects of program input factors are low, the program has been successful because of strong political commitments and involvement of many government departments. Thus, the two factors that tend to dominate the effect of any given level of inputs into the family planning program on acceptance of contraceptive methods, and thereby on fertility decline, appear to be political will for the small family norm and the program's organizational efficiency.

Chapter 6

MODERNIZATION, CONTRACEPTION, AND FERTILITY DECLINE

Chapter 5 reviewed the secular trends in contraceptive acceptance and use in India since the introduction of the national family planning program, and observed the emergence of strong differentials among the states and various socioeconomic groups. An empirical analysis of data from four states attempted to determine whether these differentials in acceptance of contraception are correlated with variations in different program input factors. Surprisingly, a very high proportion of the variation in the acceptance of contraception is attributable to nonprogram factors. Chapter 6 will explore Indian fertility trends and differentials to assess the extent to which they are attributable to changes in the demographic structure of the population, socioeconomic characteristics, and family planning program factors.

The discussion in the earlier chapters also revealed that any analysis of fertility trends and differentials among the states or different socioeconomic groups should consider the three important proximate determinants of fertility: nuptiality patterns, contraceptive practices, and natural fertility. While the literature on Indian fertility has placed considerable emphasis on the first two factors, trends and differentials in natural fertility have had insufficient emphasis. In Chapter 3, based on estimated fertility rates among Indian women in various regions prior to 1960 when there was negligible use of modern contraception, we observed that natural fertility had been historically low, only about 60 percent of the level for European women in the 18th and 19th centuries. The total fertility rate in India has hovered around six children from the beginning of this century until the early 1960s.

Table 6.1 provides the best estimates of TFR since 1881, derived by applying generalized stable population theory to the size and age distributions recorded in various Indian censuses. Natural fertility was kept well below the biological maximum mainly through social and religious factors such as checks on widow remarriage and sexual indulgence plus prolonged breastfeeding.

It was also observed in Chapter 3 that because of modernization since the late 1950s in India, many of the traditional and cultural checks that kept fertility levels low for centuries have been weakened and natural fertility levels have tended to increase since the early 60s. Empirical evidence for such an increase was also furnished by comparing estimates of age-specific marital fertility among younger women in the same population separated by a generation and across states between 1959 and 1972. From 1959 to 1972 natural fertility seems to have risen by as much as about 20 percent in 8 of the 11 states analyzed.

6.1 Estimates of CBR and TBR before and after Independence: India, 1881-1989

Period	Before Independence		Period	After Independence	
	CBR	TFR		CBR	TFR
1881-1891	46.6	5.76	1951-61	45.60	6.06
1891-1901	46.2	5.73	1961-71	41.10	5.94
1901-11	46.4	5.72	1971	36.90	5.20
1911-21	45.6	5.70	1976	34.40	4.40
1921-31	45.9	5.81	1981	33.90	4.50
1931-41	46.2	5.95	1986	32.60	4.20
1941-51*	45.0	5.91	1989	30.50	3.90

*ca. 1946

Note: CBR = crude birth rate; TFR = total fertility rate; the interdecadal estimates correspond to the middle of the decade.

Source: Mari Bhat, 1986; India, Registrar General, Sample Registration System

As contraceptive practice expands in a society, it becomes increasingly difficult to estimate natural fertility. Couples who use no contraception and whose fertility can be expected to approximate natural fertility levels become an increasingly select group of less and less fecund women who do not seem to need artificial methods of contraception to regulate their fertility. Under such circumstances, estimating natural fertility levels must be done using some theoretical framework or models. Two such frameworks are Bongaart's model (Bongaarts, 1978) and the Coale-Trussell model (Coale and Trussell, 1974). Both models allow estimation of natural fertility (total natural marital fertility rate or TNMFR) from the observed total marital fertility rate (or age-specific marital fertility rates) and the prevalence and effectiveness of contraceptive use by age of women in the population. Although these two models were mainly developed to estimate the impact of a given level of contraceptive use (and other proximate variables in the case of Bongaart's model) on fertility levels (assuming that natural fertility has not changed), they can also be used to estimate natural fertility from observed levels of marital fertility and contraceptive use in the population and changes in them over time (Pathak and Ram, 1992). See Table 6.2 for estimates of TNMFR for 1981 and 1988 for India and the larger states.

The estimate of 1981 natural fertility is 7.3 according to Bongaart's model and 7.0 according to Coale-Trussell's model. However, in 1988, when contraception use was quite high in India, estimates using Bongaart's model were quite high and unrealistic in many states. There is an implicit assumption in the model that fertility of users and nonusers of contraception remains at the same level, and even when they change with time, they tend to change in an identical manner. In 1981, across the states estimates of TNMFR varied only slightly between Gujarat and Andhra Pradesh according to both methods. But in 1988 Bongaart's method gave an unacceptably high estimate of 20.5 for Punjab. Coale-Trussell's method provides a more reasonable 1988 estimate of nearly 8--ranging from 8.9 in Punjab to 6.7 in Andhra Pradesh. Even as late as 1988, natural fertility in India continued to rise with at least a 10 percent increase in TNMFR between 1981 and 1988. In recent years an average Indian couple could be expected to bear nine children (an average of the two methods) in their lifetime if there was no use of modern contraception and they remained married through the entire reproductive span.

OBSERVED FERTILITY CHANGES AND DATA SOURCES

Table 6.3 gives estimates of crude birth rates and other fertility measures for 1972 and 1989 for India and major states as obtained from the Sample Registration System; these years capture the duration of significant demographic transition and are also those for which state and national fertility estimates are considered the most reliable in the past two decades. A

Table 6.2 Estimates of Total Natural Marital Fertility (TNMFR) Using Two Methods: India and Major States, 1981-88

India & States	Bongaarts Model		Ratio of 1988 to 1981	Coale-Trussell Model		Ratio of 1988 to 1981
	1981	1988		1981	1988	
India	7.3	9.5	1.30	7.0	7.7	1.10
Andhra Pradesh	6.6	7.8	1.18	6.5	6.7	1.03
Bihar	7.3	8.4	1.15	7.1	7.3	1.03
Gujarat	8.5	11.1	1.31	8.5	8.5	1.00
Haryana	8.2	13.6	1.66	7.6	8.2	1.08
Karnataka	7.0	9.8	1.40	6.8	8.3	1.22
Kerala	7.5	8.6	1.15	7.6	7.2	0.95
Madhya Pradesh	7.7	9.4	1.22	7.5	8.0	1.07
Maharashtra	7.5	12.0	1.60	6.9	8.2	1.19
Orissa	7.6	9.1	1.19	7.2	7.7	1.07
Punjab	7.0	20.5	2.93	7.7	8.9	1.16
Rajasthan	6.7	7.6	1.13	6.9	7.1	1.03
Tamil Nadu	7.3	10.4	1.42	6.6	7.1	1.08
Uttar Pradesh	7.2	9.3	1.29	7.2	7.7	1.07
West Bengal	7.8	7.7	0.99	7.3	6.9	0.95

Source: Pathak and Ram, 1992

hard core problem of demographic studies in India is reliability and validity of data on vital rates.

The vital registration system--the civil registration of marriages, births, and deaths--is the only data source for vital events with the potential to provide time trends on nuptiality, fertility, mortality and their correlates at any level of aggregation for a country. Every developed country maintains a good, reliable vital registration system. It is no exaggeration to say that a country's level of development can be assessed from the completeness and reliability of its registration system. In India, registration of births and deaths were made compulsory by the Births and Deaths Registration Act of 1899, but the rules and procedures varied from province to province in British India. A national, comprehensive vital registration act was passed in independent India in 1961 requiring that all births be registered within 14 days of occurrence and all deaths within 7 days. Responsibility for registration was entrusted to the state government, which passed the duty to different departments--the revenue department, the home department (internal security), or the public health department. Unfortunately, in most states the coverage and quality of vital registration has hardly improved over the decades and in many areas it has actually deteriorated. There is practically no registration of marriages (although it has been required since 1978) and hardly 60 percent of births and deaths are registered except in Goa and Kerala and a few metropolitan cities such as Bombay, Delhi, and Madras where registration data are fairly reliable. In the context of increasing emphasis on family planning and public health programs to control fertility and mortality, lack of reliable data from the vital registration system poses a great hurdle in proper program planning and evaluation.

Under these circumstances, any evaluation of the impact of these programs, must be carried out using indirect fertility and mortality estimates derivable from the decennial population censuses and from the sample registration system (SRS) in place since the late sixties. The SRS has provided, since 1970, fairly reliable state-level data on rural and urban fertility and mortality. Large-scale regional sample surveys conducted at various intervals also provide fertility and mortality estimates. The census can provide data on fertility only for the year preceding it (if relevant questions have been asked) or as an average for the intercensal period from indirect methods of estimation based on population age distributions and number of children born and living in successive censuses. In the 1981 and 1991 censuses, data have been collected on the number of children born and alive for all ever married women at the time of the census and such information from the 1981 census has been used to compute district-level fertility rates (TFR), using the Brass method (Brass, 1975). However, these district-level fertility estimates are of questionable quality, varying from state to state depending on the accuracy of census data on children born and alive, as

6.3 Fertility Measures: India and Major States, 1972 and 1989

State	1972					1989				
	CBR	TFR	GFR	TMFR	GMFR	CBR	TFR	GFR	TMFR	GMFR
Andhra Pradesh	35.9	4.7	153.2	5.5	183.4	25.9	3.1	104.8	4.3	130.6
Assam	39.2	5.8	188.4	7.3	245.6	29.4	3.4	114.8	6.6	208.2
Bihar	32.0	5.2	161.3	5.7	181.7	34.3	5.1	157.2	6.0	190.5
Gujarat	43.5	6.2	192.5	7.4	241.7	28.7	3.6	123.4	4.8	166.0
Haryana	46.5	7.4	222.8	7.8	257.4	35.2	4.4	151.3	5.3	187.7
Himachal Pradesh	39.3	5.5	169.3	6.5	207.7	27.7	3.2	110.7	5.7	166.3
Jammu and Kashmir	NA	NA	NA	NA	NA	39.1	3.3	104.0	5.7	171.8
Karnataka	32.4	4.6	142.8	5.6	181.8	28.0	3.3	111.9	5.2	165.2
Kerala	35.0	4.6	142.1	6.9	220.4	20.3	2.0	71.4	4.3	128.0
Madhya Pradesh	48.8	7.0	219.1	7.6	245.9	35.5	4.7	152.8	5.6	183.8
Maharashtra	36.1	4.9	157.5	5.8	192.3	28.5	3.4	111.6	4.6	146.9
Orissa	37.3	5.0	157.7	5.7	190.3	30.5	3.6	119.2	5.1	161.3
Punjab	38.0	5.7	171.8	7.1	230.4	28.3	3.3	114.8	5.3	161.8
Rajasthan	46.2	7.0	217.3	7.5	241.8	34.2	4.7	151.5	5.6	183.4
Tamil Nadu	33.7	4.3	135.5	5.6	181.4	23.1	2.5	86.7	4.5	126.9
Uttar Pradesh	49.4	7.3	237.6	8.0	249.9	37.0	5.2	161.6	6.3	199.3
West Bengal	NA	NA	NA	NA	NA	27.2	3.3	109.5	4.9	153.6
India	40.7	5.7	179.6	6.7	218.3	30.6	3.9	126.5	5.3	167.8

Note: CBR = crude birth rate; GFR = general fertility rate; GMFR = general marital fertility rate; TFR = total fertility rate; TMFR = total marital fertility rate

Source: India, Registrar General, various years

well as errors in reporting maternal ages. Hence, use of district-level TFRs from the census to study trends and differentials in fertility and their determinants is not undertaken here.

The sample registration system is a dual recording system implemented by the Registrar General on a sample of villages in rural areas and urban blocks in towns and cities. In this system, data are collected in the sample units by two independent sources: (1) a continuous registration system wherein a local registrar (usually a teacher) records vital events as they occur; and (2) through a semi-annual survey by trained investigators of all households in the sample locations to detect births and deaths since the previous visit, and to obtain data on population size and composition. Events recorded in the continuous registration procedure are matched event by event (for births and deaths) against those recorded in the household survey. Those recorded only once are verified in the field for accuracy to determine the total number of events to include for the estimation of vital rates as derived from both sources. At the present stage of data availability, the sample registration system is the most comprehensive method, providing state-level and all-India time-series estimates of rural and urban fertility and mortality. Unfortunately, even the rates obtained from this system have been questioned because of data collection errors in both sources, matching of events, and the representation of sample villages included in the SRS in different states.

In some years, the SRS has made special surveys of sample households to study in detail specific demographic aspects of the population. One survey gave estimates of rural and urban marital fertility and other fertility measures for 1972 in different states. Similarly, a survey of fertility and child mortality was conducted in 1978, the International Year of the Child. Data quality in the regular SRS has improved since 1981 because of the Registrar General's special efforts to add new samples and improved quality control on household surveys. The 1989 SRS estimates on age-specific marital fertility are considered to be the most reliable for analyses of trends and differentials.

The fertility measures used for analysis are the crude birth rate (CBR), total fertility rate (TFR), general fertility rate (GFR), total marital fertility rate (TMFR), and general marital fertility rate (GMFR) for 1972 and 1989. In all states for which data were available, and in almost all indicators considered, a substantial decline in fertility was found from 1972 to 1989 (Table 6.3). The only exception was Bihar where TMFR and GMFR increased. For the country as a whole the crude birth rate declined by 24.8 percent, TFR by 31.6 percent, GFR by 29.6 percent, TMFR by 20.9 percent, and GMFR by 23.1 percent. Kerala showed the maximum decline on all indicators, with Tamil Nadu second. Bihar, Karnataka, and Orissa showed minimal fertility declines--less than 20 percent for most indicators.

The factors underlying the differences in fertility changes, as diverse fertility indicators reveal, are essentially because of demographic structural changes in the population. Changes in the age-sex-marital status distribution between 1972 and 1989 can cause uneven changes in

the CBR of a state or the country even when marital fertility measures have been steadily declining. As a first step in analyzing demographic factors associated with changes in the CBR between 1972 and 1989, techniques of standardization were used to partition the extent of changes attributable to various factors.

DEMOGRAPHIC COMPONENTS OF FERTILITY CHANGES

Table 6.4 provides the findings from a decomposition of the extent of changes in the crude birth rate between 1972 and 1989 for different states and India using the standardization method described in Manual IX (United Nations, 1978). The age-sex-marital distribution of India or a particular state in 1972 is taken as the standard. The absolute change and the percentage changes in CBR between 1972 and 1989 are attributable to four factors: age structure (population age distribution); marital status (proportions married in different ages); marital fertility (or changes in age-specific marital fertility rates), and proportion of women in reproductive ages to total population. With the technique of standardization, most changes in the CBR in India and the major states could be explained by these four factors except in Assam, Himachal Pradesh, and Karnataka, where the unexplained quantum of change was over 30 percent. In all states except those three, as well as Bihar and Orissa, reduced marital fertility played the most dominant role in lowering the CBR. About 80 percent of the reduction in India's CBR is attributable to reduced marital fertility. Marital fertility changes have contributed to more than 90 percent of the difference in the CBR in Gujarat, Haryana, Kerala, and Punjab. It is noteworthy that a sharp increase in marital fertility contributed to a rise in CBR in Bihar, indicating the extent to which the fertility-increasing effects of modernization continue to alter CBR trends even when the effective couple protection rate has escalated from 5 percent in 1971 to 23 percent in 1988 in this state.

Changes in the marital status distribution of the population have contributed to a decline in crude birth rate in all states and the nation mainly because of a rise in the age at marriage. The effect of such changes in reducing the CBR seems to be substantial and greater than the changes in marital fertility in Assam, Bihar, Himachal Pradesh, Karnataka, and Orissa. Changes in the proportions of women of reproductive ages (PWRA) and in their age distribution within the reproductive ages (AS) seem to have jointly contributed to increasing CBR in most states. The potential for future increased fertility because of an increase in PWRA and that, too, in younger more fertile ages can be seen from these figures. The effect is highest in Assam (81 percent), Punjab (79 percent), Karnataka (77 percent), Haryana (60 percent), Kerala (46 percent), and Maharashtra (45 percent), where they have contributed to half or more of the increase in CBR. The analysis reveals that the demographic forces of change in PWRA in the total population and the age structure of

Table 6.4 Decomposition of Changes in CBR, Attributable to Different Factors Estimated by the Standardization Procedure, Using 1972 as Standard: India and Major States, between 1972 and 1989

States & India	Absolute Change						Relative Change				
	AS	MS	MF	PWRA	TCE	TCO	AS	MS	MF	PWRA	TCE
Andhra Pradesh	-.30	-3.48	-7.04	1.95	-8.87	-10.25	-2.93	-33.95	-68.68	19.02	-86.54
Assam	.16	-12.47	-3.51	8.49	-7.33	-10.62	1.51	-117.42	-33.05	79.94	-69.02
Bihar	-.26	-2.56	2.38	-1.92	-2.36	-2.92	-8.90	-87.67	81.51	-65.75	-80.81
Gujarat	1.49	-4.28	-13.51	1.31	-14.99	-14.70	10.14	-29.12	-91.90	8.91	-101.97
Haryana	1.36	-2.91	-13.14	5.44	-9.25	-11.32	12.01	-25.71	-116.08	48.06	-81.72
Himachal Pradesh	.90	-7.91	-3.83	3.03	-7.81	-11.66	7.72	-67.84	-32.85	25.99	-66.98
Karnataka	.09	-5.22	-.73	3.33	-2.53	-4.44	2.03	-117.57	-16.44	75.00	-56.98
Kerala	1.40	-6.67	-13.70	5.40	-13.57	-14.71	9.52	-45.34	-93.13	36.71	-92.24
Madhya Pradesh	-.18	-4.27	-11.14	2.19	-13.40	-13.23	-1.36	-32.28	-84.20	16.55	-101.29
Maharashtra	-.79	-2.52	-6.74	4.17	-5.88	-7.54	-10.48	-33.42	-89.39	55.31	-77.98
Orissa	.21	-4.74	-3.58	3.01	-5.10	-6.78	3.10	-69.91	-52.80	44.40	-75.21
Punjab	2.25	-3.96	-10.14	4.40	-7.45	-9.66	23.29	-40.99	-104.97	45.55	-72.12
Rajasthan	-.09	-3.47	-10.32	2.85	-11.03	-12.12	-.74	-28.63	-85.15	23.51	-91.01
Tamil Nadu	.18	-3.73	-8.84	2.40	-9.99	-10.40	1.70	-35.19	-83.40	22.64	-94.25
Uttar Pradesh	.87	-4.21	-9.51	1.79	-11.06	-11.17	7.39	-35.77	-80.80	15.21	-93.97
India	.13	-4.12	-8.00	2.78	-9.21	-10.11	1.30	-41.16	-79.92	27.77	-92.01

Note: AS = age structure; MS = marital status; MF = marital fertility; PWRA = proportion of women of reproductive ages in total population; relative TCO = - 100 for each row; TCE = total change explained; TCO = total change observed. The difference between observed and explained changes is because of the neglected interaction terms. Percentage changes were computed in relation to the observed CBR change, not to the explained change. Negative changes represent declines in rates; positive changes represent increases.

women within these ages together contributed to an increase in CBR in this period. Achieving rapid declines in CBR even with increased age at marriage and reduced marital fertility will be difficult.

Changes in the demographic structure of the population, especially in PWRA and the age structure of women within these ages that would take place in India in the next two decades, can be expected to raise the CBR even in the context of moderate declines in marital fertility. This is a demographic momentum factor caused by declining fertility (which tends to increase PWRA to total population) and a slow rise in age at marriage; both tend to increase the proportion of married women below age 30 among all married women in reproductive ages. To achieve significant future declines in India's CPR, marital fertility declines must be substantial and rapid enough to overcome the fertility-increasing effects of two forces: the continuing rise in natural fertility because of modernization and the demographic momentum caused by earlier fertility declines.

CONTRACEPTIVE USE AND FERTILITY DECLINE

Earlier it was seen that about 80 percent of the decline in CBR between 1972 and 1989 was attributable to a decline in marital fertility and that the general marital fertility rate (GMFR) declined by 23.1 percent during this period. In the context of a potential rise in natural marital fertility (Table 6.2) and the demographic momentum factor that tends to increase the relative proportion of married women under 30 in the reproductive ages who have higher fertility, there must be increased contraceptive use for marital fertility to decline. The only alternative is widespread induced abortion as happened in Japan in the late 1940s and mid-1950s and later in many Eastern European countries. In India since 1972, the Medical Termination of Pregnancy Act facilitates induced abortion within the first six weeks of pregnancy, but the practice has not become widespread and is largely limited to major city hospitals. The government does not want these abortion facilities to be misused for selective abortion of female fetuses in the context of modern medical technological advances to identify fetal sex, such as sonography (possible at 12 weeks but not completely accurate until 22 weeks or more after conception), amniocentesis (possible at week 16 or after), and chorionic villus biopsy (possible at week 9 or 10) (Guttmacher and Kaiser, 1986). Reasons for the sparse use of abortion may be fears about its consequences among women, moralistic and religious factors, and the reluctance of medical personnel to perform abortions. Under these circumstances, any observed reduction in marital fertility so far is almost totally attributable to use of artificial or natural contraceptive methods.

Indian family planning programs not only promote acceptance of methods from program sources but also from nonprogram sources such as voluntary organizations, private medical practitioners, and pharmacists. A precise assessment of the impact of program and

nonprogram acceptance of contraceptive use on marital fertility is difficult without reliable time-series data on both variables. In India the extent of contraceptive practice from program sources is measured by the index of couple protection rate (see Chapter 5). These are computed from the official family planning service statistics data. Data on contraceptive prevalence in the population as a whole from program and other sources can be obtained only from population-based sample surveys. The latest information from a survey conducted by ORG Baroda is available for 1988.

Table 6.5 provides yearly time-series data on 1970-88 effective couple protection rates (CEP) and corresponding 1971-89 fertility rates (TFR). The correlation between the two series of figures is quite high with the zero order correlation coefficient $r = -0.85$. The regression equation between TFR (y) and CEP (x) over the years is given by

$$Y = 9.00 - 0.056 X \quad (1)$$

This type of correlational analysis is defective partly because of a built-in autocorrelation for TFR and CEP values over successive years. Corrections for autocorrelations can be made; even after the corrections (Durbin-Watson method), the correlation coefficient remains high and significant at $r = -0.62$ (Durbin and Watson, 1951). Thus there is a clear association between trends in fertility and CEP rates achieved by the program over time.

However, when we analyze the changes in general marital fertility by states from 1972 to 1989 and relate them to changes in 1971-88 CEP, we find interesting results. Table 6.6 gives the classification of 16 states by the percentage increase in 1971-88 CEP with the percentage 1972-89 decline in GMFR. If the married women using contraception form a random sample of all women in the reproductive ages with regard to expressed and potential fertility levels, then any percentage increase in married couples' effective use of contraception should have an equivalent decline in general marital fertility. Thus if CEP increased from x percent in 1971 to (x + y) percent in 1988, GMFR values can be expected to decline by y percent between 1972 and 1989 if all other factors affecting marital fertility remained unchanged.

The effectiveness of any level of contraceptive practice on marital fertility has varied from state to state in terms of consistency between percentage changes in CPR and CEP values from 1971 to 1988. Kerala's recording over 40 percent decline in GMFR is not commensurate with the increase in its CEP values. Only four states fall in the diagonal representing concordance between increased CEP and declines in GMFR.

Equivalence in increased CEP and GMFR declines is realized only in Andhra Pradesh, Madhya Pradesh, and Rajasthan. Punjab and Haryana have the maximum discordance, with increases of 51.4 and 43.5 percent in CEP, but GMFR declines of only 29.8 and 26.8

Table 6.5 Trends in Effective Couple Protection Rates (CEP) and Fertility Rates (TGR): India, 1971-89

Year	TFR (t)	CEP (t-1)
1971	5.2	10.4
1972	5.2	12.2
1973	4.9	14.5
1974	4.9	14.7
1975	4.4	14.8
1976	4.1	17.0
1977	4.4	23.5
1978	4.4	22.5
1979	4.4	22.4
1980	4.5	22.3
1981	4.5	22.8
1982	4.5	23.7
1983	4.5	25.9
1984	4.5	29.5
1985	4.3	32.1
1986	4.2	34.9
1987	4.1	37.5
1988	4.0	39.9
1989	3.9	41.9

Source: India, Ministry of Health and Family Welfare, Department of Family Welfare, 1991b

Table 6.6 Percentage Changes in 1972-89 General Marital Fertility Rate (GMFR) Related to Percentage Changes in 1971-88 Effective Couple Protection Rate (CEP): Indian States

GMFR Change 1972-89	CEP Change 1971-78			
	20	20-29	30-39	40+ %
<20	Bihar	Orissa	Karnataka	
20-29	Uttar Pradesh Assam	Andhra Pradesh Madhya Pradesh Rajasthan (India)	Himachal Pradesh	Haryana Maharashtra Punjab
30-39		West Bengal		Gujarat Tamil Nadu
40+			Kerala	

Source: India, Ministry of Health and Family Welfare, Department of Family Welfare, 1991b

percent respectively. Discordance levels were also relatively high in Bihar, Orissa, and Karnataka.

Divergence between levels of contraceptive use from program sources and fertility levels over time seem to be rising with time. For example, the regression equations between 1972 TFR (y) with effective couple protection rate of 1971 (x) across 15 large states are

$$y = 6.64 - 0.09 X \quad (2)$$

$$n = 15 \quad r^2 = 0.13$$

Similarly, 1984 TFR compared to 1983 CEP and 1989 TFR compared to 1988 CEP yielded the following regression and R^2 values:

$$\text{TFR} = 6.32 - 0.08X \quad (3)$$

$$\text{TFR} = 4.71 - 0.03X \quad (4)$$

For 1984, $R^2 = 0.49$ ($n = 17$) and for 1989 the $R^2 = .09$ ($n = 17$). It is evident from these equations that the explanatory power of CEP on total fertility in Indian states increased between 1972 and 1984 but has declined subsequently as indicated by the R^2 values. The Beta coefficient has declined over the years, indicating that over time higher levels of use within the program are required to achieve a specified decline in TFR values.

MULTIVARIATE ANALYSIS

The extent to which socioeconomic changes and the family planning program have separately and independently contributed to declines in Indian fertility are difficult to assess precisely because changes are occurring simultaneously on all three proximate determinants of fertility: natural fertility, nuptiality patterns, and contraceptive use. Among these, the most difficult to measure are changes in natural fertility or marital fertility among women that would have prevailed had there been no deliberate control. Natural fertility levels are increasing in all states with a time lag. The more modern states like Kerala and Punjab have reached their peak levels, while the least modern states such as Bihar and Rajasthan are currently experiencing large increases in natural fertility. The current estimate of total natural marital fertility (TNMFR) is estimated to be around nine children, while the 1989 observed total marital fertility rate for Indian women was estimated to be 5.3 (Table 6.3). This 40 percent reduction in total marital fertility is attributed to deliberate use of artificial or natural family planning methods. The discordance between CEP and TFR noted above should not be viewed as a lack of impact of contraception on fertility but partly due to an indication of the quality of data on CFP and partly as the increasing use of contraception outside the program.

Using macrolevel data, we can analyze the extent to which changes in nuptiality and contraceptive use, within the program and outside, are correlated with Indian fertility levels and also the extent to which different developmental variables influence the proximate determinants and fertility directly. A multivariate model relating the socioeconomic variables

with nuptiality and contraceptive use and the TFR has been applied to the most recent data sets.

This analysis used variables representing socioeconomic conditions, contraceptive use, and fertility measures for India and the large states around 1989. Data on key state-level social, economic, and health service variables were collected around 1988-89 to investigate the extent to which the variables were associated with observed fertility differentials in 1989. The variables were (1) per capita net domestic product in 1988-89 at 1980-81 prices; and for 1988, (2) percentage of urban to total population; (3) percentage of females age 7+ literate; (4) length of roads in kilometers per 100,000 population; (5) infant mortality; and (6) number of auxiliary nurse midwives per 100,000 population. The two proximate determinants of fertility are contraceptive use and percentage of females married aged 15 to 19 in 1988. For the variable on contraceptive use, two indicators were used: the percentage of couples effectively protected (CEP) derived from official statistics and CPR from the 1988 ORG population-based survey. The percentage of 15-19 year-old women married has been used as a proxy for bride's age. The lower this proportion, the higher the age at marriage of females. The fertility measure used was the 1989 total fertility rate. See Table 6.7.

The data reveal that India remains very poor economically and socially and that improvements since independence have been neither spectacular nor uniform across the states. The 1988-89 per capita net domestic product at 1980-81 prices was about US \$186 (1 US dollar = 12 Rs., at the 1980-81 exchange rate) and ranged by 2481 rupees (about \$207) from Bihar to Punjab. India continues to be largely rural with only 25 percent of its population living in urban areas in 1989, ranging by almost 30 percentage points from Himachal Pradesh to Maharashtra. The average length of motorable roads per 100,000 population was 233 km with a 562 km range from West Bengal to Orissa.

Fieldwork on the family planning front in most of India is carried out by auxiliary nurse midwives (ANMs) intended to be employed at the rate of 1 per 5000 population; they form the backbone of the family planning program. For the country as a whole there are 131 ANMs per million population, ranging from a deficit of 77 in Jammu and Kashmir to an excess of 105 in the Himachal Pradesh.

India has the world's largest pool of illiterate women with only 36.5 percent of females above age 7 literate in 1988, and the remaining 63.5 percent-about 191 million-illiterate. Having barely a third of its females literate makes the task of motivating females for family planning difficult. The literacy rate varies from under a fifth in Rajasthan to over four-fifths in Kerala. Infant mortality in India has been steadily declining over the years but is still high, estimated at 94 infant deaths per thousand live births in 1988. The IMR varies by 96 deaths from Kerala to Uttar Pradesh.

Table 6.7 Socioeconomic and Demographic Conditions: India and States, circa 1989

State	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11
Andra Pradesh	1692	25.3	225.4	30.9	83	103	39.0	50.3	43.6	3.1	4.3
Assam	1558	10.7	275.1	43.7	99	120	26.2	43.1	18.8	3.4	6.6
Bihar	1071	13.0	104.5	21.1	97	93	22.9	30.7	49.4	5.1	6.0
Gujarat	2506	33.4	191.5	45.5	90	101	53.2	56.2	26.0	3.6	4.8
Haryana	3086	23.9	167.4	36.7	90	145	56.4	53.1	31.7	4.4	5.3
Himachal Pradesh	1948	8.4	460.7	48.1	80	236	44.6	52.9	19.3	3.2	5.7
Karnataka	2041	30.3	294.2	41.0	74	105	42.3	47.5	27.2	3.3	5.2
Kerala	1447	24.1	435.5	83.6	28	134	46.4	80.1	10.5	2.0	4.3
Madhya Pradesh	1746	22.3	207.5	25.6	121	138	36.2	39.4	51.8	4.7	5.6
Maharashtra	2960	37.6	287.4	47.7	68	155	54.7	54.7	35.2	3.4	4.6
Orissa	1455	12.9	654.0	31.6	122	163	37.5	45.3	27.2	3.6	5.1
Punjab	3552	29.1	266.6	46.7	62	162	68.2	69.3	7.8	3.3	5.3
Rajasthan	1620	22.3	257.3	18.8	103	144	27.9	30.0	49.2	4.7	5.6
Tamil Nadu	2030	33.8	308.4	48.7	74	148	52.6	59.3	18.3	2.5	4.5
Uttar Pradesh	1547	19.3	143.5	23.4	124	162	28.8	28.3	38.9	5.2	6.3
West Bengal	1930	27.1	92.1	43.9	69	102	54.8	54.8	31.9	3.3	4.9
India	2234	25.0	232.9	36.5	94	131	39.9	44.9	34.0	3.9	5.3

X1 = Per capita net 1988-89 domestic product at factor cost in 1980-81 prices

X2 = Percentage urban of total 1988 state population*

X3 = Road length in km per 100,000 population in 1988

X4 = Percentage of females literate, ages 7+ in 1988*

X5 = Infant mortality rate in 1988

X6 = Auxiliary nurse midwives per million population in 1988

X7 = Effective couple protection rate in 1988 from service statistics

X8 = Contraceptive prevalence rate estimated from 1988-89 ORG sample survey

X9 = Percentage of females aged 15-19 married in 1988 from SRS data

X10 = Total fertility rate in 1989

X11 = Total marital fertility rate in 1989

*Obtained by interpolation between 1981 and 1991 census figures

Source: Year Book 1989-90: Family Welfare Program in India, Ministry of Health and Family Welfare; Paper 1, Census of India-1981 and 1991

The effective couple protection rate (CEP) in March 1988, estimated from official service statistics, was 39.9 percent for India with a range of 45.3 percentage points from Bihar to Punjab. The 1988 contraceptive prevalence rate (CPR) was estimated from the 1988-89 ORG national sample survey to be 44.9 percent compared to the official figure of 39.9 percent (CEP). The CPR varied from four-fifths of Kerala couples to somewhat over a fourth of Uttar Pradesh couples. As discussed in detail in the previous chapter the population-based estimate of CPR includes use of contraception from nonprogram sources and also use of traditional methods of family planning such as rhythm, abstinence, and coitus interruptus.

The proportion of women married in the ages 15-19 is very highly and negatively correlated with bride's age--the higher this proportion, the lower the age at marriage. In 1988, a third of girls aged 15-19 were married, with a range of 44 percentage points from Punjab to Madhya Pradesh.

The 1989 total fertility rate for all India was estimated at 3.9 children, ranging from replacement level in Kerala to over five in Uttar Pradesh and Bihar. The total marital fertility rate (TMFR) for India for 1988 was estimated at 5.3 births, ranging from 6.6 and 6.3 in Assam and Uttar Pradesh to 4.3 in Kerala. TMFR implies that all women remain married from ages 15 to 44, experiencing the observed fertility rates of married women in each age. At age 15-19, the proportions married varied substantially from state to state, so the TMFR in this age group plus the whole age range 15-44 can be expected to be influenced not only by fertility levels, but by age at marriage.

Table 6.8 is a correlation matrix of the variables in Table 6.7. The correlation of total fertility (X_{10}) with total marital fertility (X_{11}) is quite high as expected. The correlation of TFR with CEP (X_7) is surprisingly not significant at the 5 percent level. TFR correlated with CPR (X_8) is highly significant. Correlations of TFR with economic development and urbanization are small and not significant although they are in the expected direction. But the correlation coefficients of TFR with female literacy (X_4) and infant mortality (X_5) are very high and significant. All correlations are in the expected direction except the relationship of TFR with ANMs, which, though negative, is not statistically significant. Surprisingly, correlation of total marital fertility (TMFR) with number of ANMs is positive and insignificant. Variables with statistically significant correlations with TFR are female literacy, infant mortality, contraceptive prevalence, and percentage of women married at ages 15-19.

The correlation of TFR with contraceptive use differs significantly depending on whether the CEP rate from within the program is used (here the correlation coefficient is quite low and not statistically significant) or the CPR, based on the ORG survey of eligible couples, is used (here it increases substantially). Three scatter plots and linear regressions between TFR

and infant mortality (Fig. 6.1), female literacy (Fig. 6.2), and contraceptive prevalence (Fig. 6.3) in 16 states are revealing. These regressions imply that a decline of one birth per woman (or one unit in TFR) is associated with a decline of 36 deaths per 1000 live births (infant mortality), an increase of 20 percentage points in female literacy, or an increase of 18 percentage points in contraceptive prevalence. Infant mortality explains 60 percent of the variance in the TFR; female literacy and contraceptive prevalence each account for 72 percent of the variance, implying that among all the social and economic variables considered, female literacy is the single most dominant correlate with fertility, with infant mortality the second most important factor.

No firm scientific conclusions on causal relationships among socioeconomic variables, program factors, and fertility change can be drawn from cross-sectional data compiled at one time. Such an investigation should be based on longitudinal data wherein information on all factors supposed to be causally related to fertility are compiled and analyses of relationships are undertaken over time. Lacking such data, it is necessary to infer indirectly from cross-sectional data the effects of demographic, socioeconomic, and program factors on fertility, using multiple and partial correlation analysis.

See Table 6.9 for results of a partial correlation analysis of TFR and TMFR with CEP and CPR, using the states as unit of analysis for 1989, and the correlation matrix in Table 6.8. The zero order correlation coefficient of TFR with official program-based contraceptive use (CEP) is -0.47 and with overall CPR (contraceptive protection rate from all sources, program and outside) is -0.85. Similarly the zero order correlation coefficient of TMFR with CEP is -0.54 and with CPR is -0.68. All correlations, except that of TFR with CEP, are statistically significant. As expected, fertility rates are better correlated with overall contraceptive use than use only from within the program. The impact of couple protection rates on fertility levels of married women at the state level depends on two factors--their natural fertility and potential fertility had they not used contraception. If contraceptive protection occurs mainly among older, higher parity women (as is likely for women relying on sterilization), the impact of CEP is likely to be lower than the overall protection in the population estimated by CPR. Such a conclusion is empirically validated since the correlation coefficient of TMFR and TFR with CPR is higher than with CEP. Also, for any given level of CEP or CPR, the fertility potential of contraceptive users can be expected to play an important role in determining their impact on the fertility levels. If potentially high-fertility couples are protected by contraception, the impact on fertility will be higher.

The natural fertility of women and the potential fertility of contraceptive users are to a large extent influenced by social and economic conditions. In a highly educated and motivated population, couples with high potential fertility are likely to accept family planning

Table 6.8 Correlation Matrix of Selected Variables^a

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁
X ₁	1										
X ₂	0.58 [*]	1									
X ₃	-0.13	-0.28	1								
X ₄	0.22	0.27	0.36	1							
X ₅	-0.32	-0.44	-0.08	-0.85 ^{**}	1						
X ₆	0.20	-0.31	0.54 [*]	0.12	0.06	1					
X ₇	0.87 ^{**}	0.60 [*]	0.18	0.50 [*]	-0.51 [*]	0.29	1				
X ₈	0.48	0.43	0.31	0.90 ^{**}	-0.85 ^{**}	0.10	0.74 ^{**}	1			
X ₉	-0.37	-0.09	-0.46	-0.80 ^{**}	0.61 [*]	-0.31	-0.58 [*]	-0.78 ^{**}	1		
X ₁₀	-0.16	-0.31	-0.48	-0.85 ^{**}	-0.77 ^{**}	-0.06	-0.47	-0.85 ^{**}	0.75 ^{**}	1	
X ₁₁	-0.26	-0.68 ^{**}	-0.21	-0.51 [*]	0.61 [*]	0.16	-0.54 [*]	-0.68 ^{**}	0.21	0.67 ^{**}	1

^aFor a description of variables, see notes to Table 6.7.

^{*}Significant at 0.5 level.

^{**}Significant at 0.05 level.

Figure 6.1

Infant Mortality Rate and Total Fertility Rate

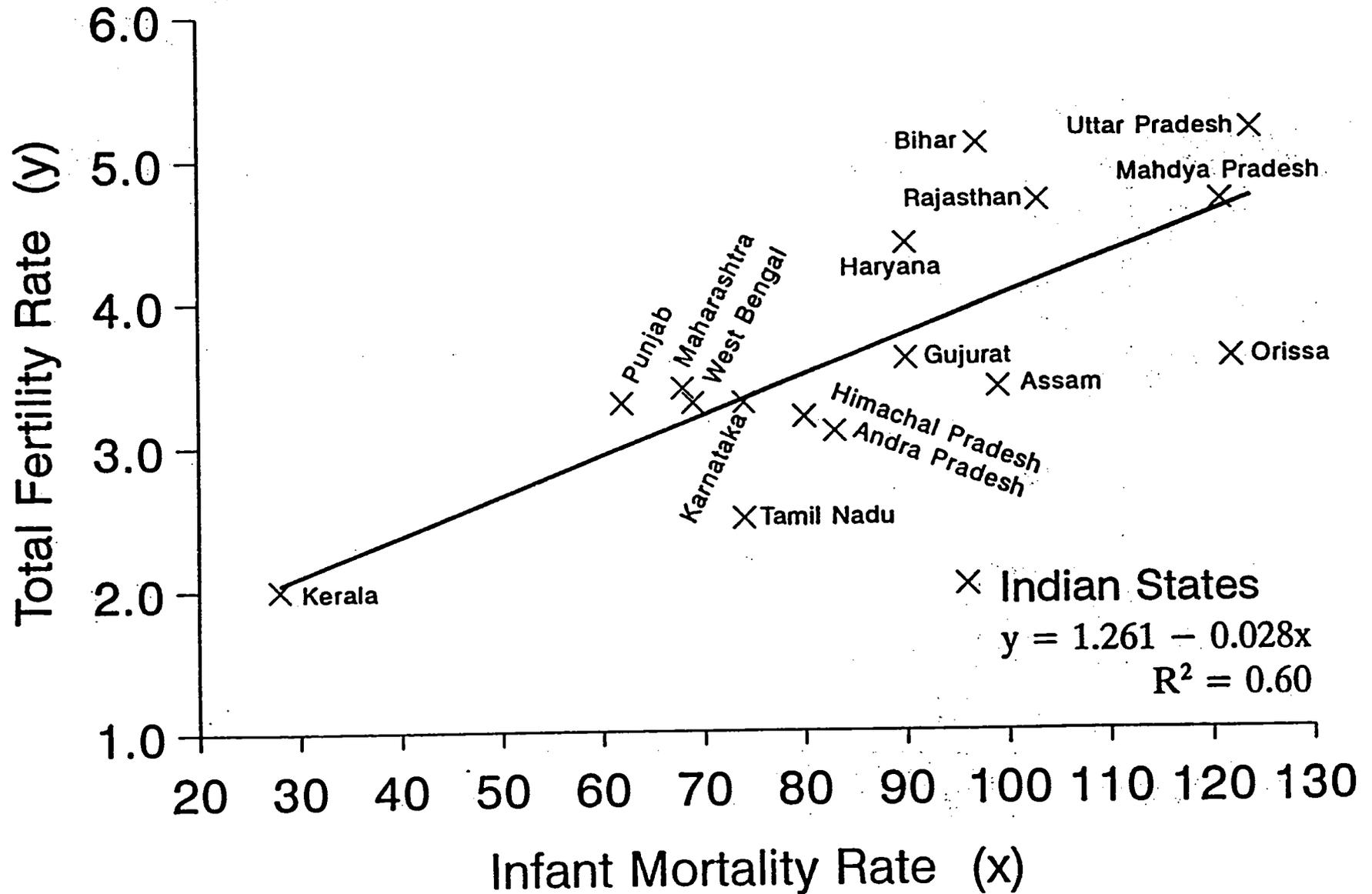


Figure 6.2

Female Literacy and Total Fertility Rate

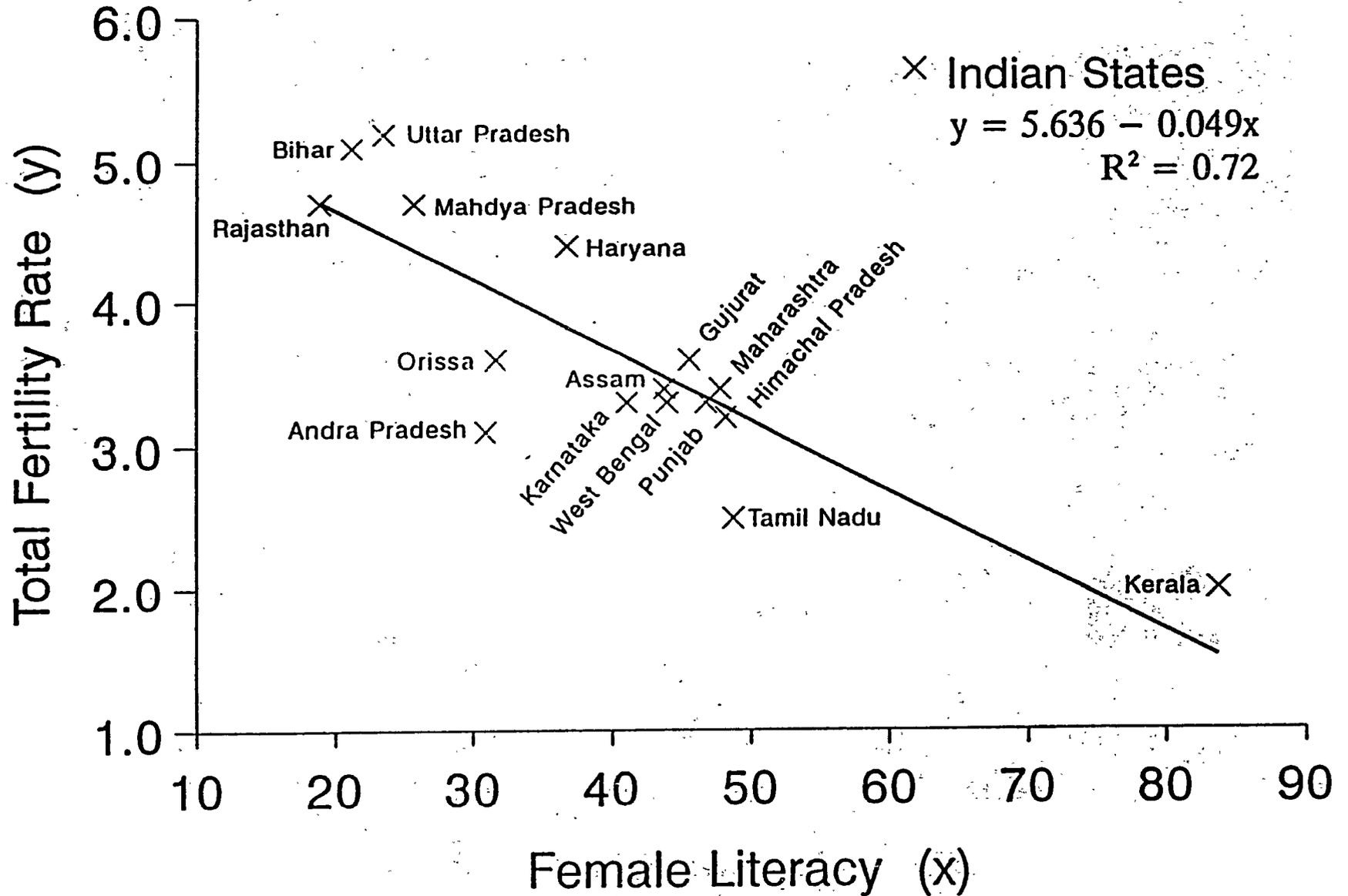
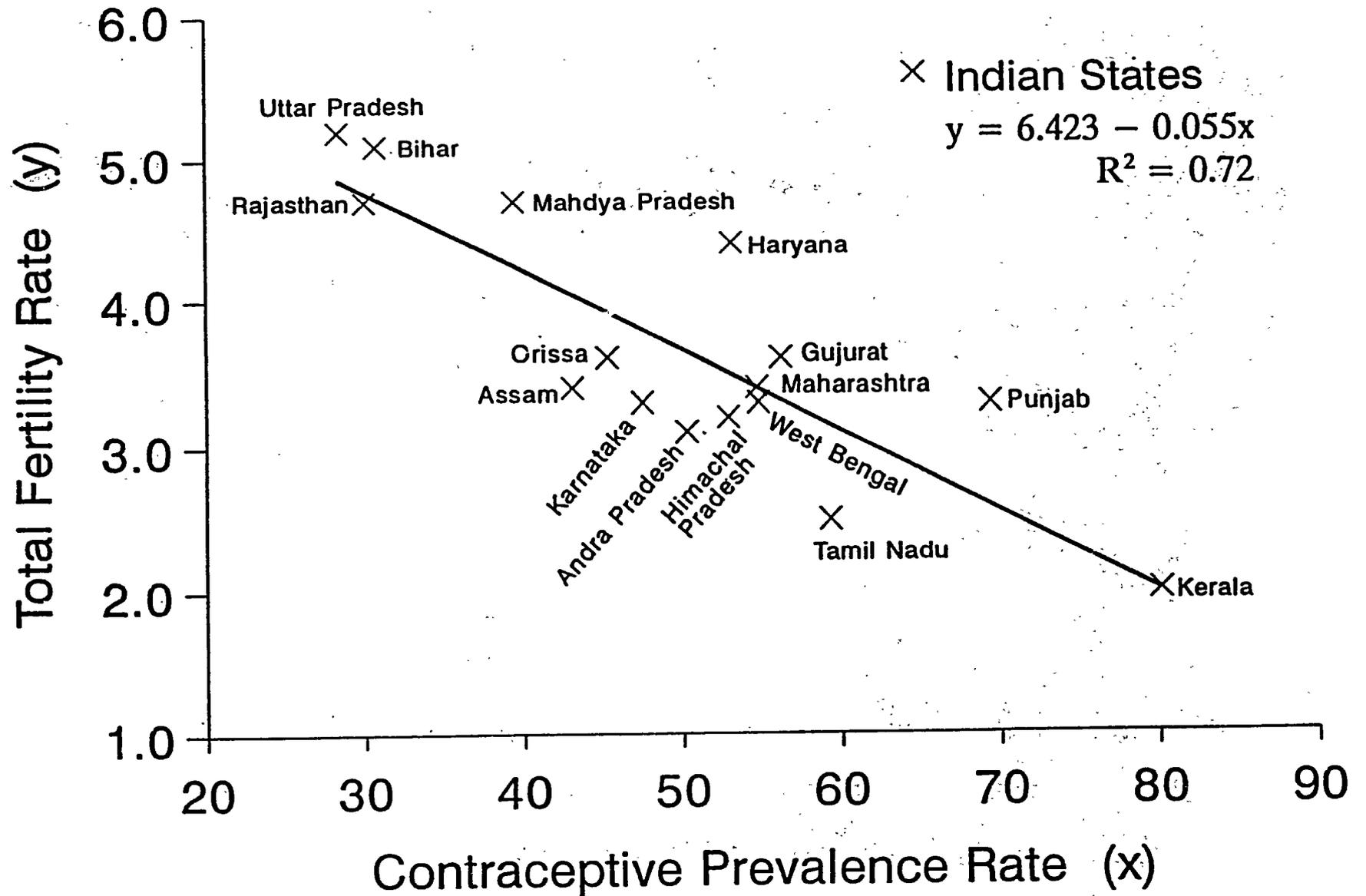


Figure 6.3

Contraceptive Prevalance Rate and Total Fertility Rate



methods at an early stage of their family-building process making the impact of contraceptive use on fertility levels higher. Socioeconomic and cultural factors determine not only the natural fertility levels of the population as a whole but also what type of couples with what levels of potential fertility come to accept and use family planning methods. If socioeconomic and cultural factors play a dominant role in determining the fertility impact of a family planning program, we can expect that the correlation coefficient between the CEP or CPR with the TFR and the TMFR will be substantially reduced and become statistically insignificant when controlled for socioeconomic variables. The impact of contraceptive use on fertility, in such a case, will be circumscribed by the social and economic factors. On the other hand, even if after controlling for various socioeconomic factors we find that the partial correlation coefficient between the CEP or CPR with fertility remains significant, we have an empirical basis for assuming that the program-based and overall contraceptive use have had a significant independent fertility impact. Based on the partial correlations, the program's direct and the total impact on fertility, as well as the impact after eliminating the effects of socioeconomic factors, can be relatively assessed. Conclusions so obtained are not unequivocal but are indicative of the nature of causation.

To gain further insight into the hypothesis above, from the present data set, the partial correlation coefficients were computed between the fertility measures (TFR and TMFR) separately with couple protection rates (CEP and CPR) controlling for the socioeconomic and health-related variables, sequentially; the analysis starts with the least manipulable of all the variables--assumed to be per capita net domestic product of the state and progresses to the variable that is relatively easiest to manipulate--the number of auxiliary nurse midwives per million population. Table 6.9 provides the sequence of partial correlation coefficients and the square of multiple correlations to test the significance of each variable added and its contribution to explaining the variance.

The partial correlation coefficients of all orders between TMFR and CPR are statistically significant (Panel D). For example, the sixth-order partial correlation coefficient (after controlling for variables X_1, \dots, X_6) was -0.73, statistically significant at the 5 percent level. The correlation coefficient of TMFR with CEP (protection within the program) becomes insignificant after controlling for per capita income, urbanization and road mileage (Panel B). This indicates that the direct impact of the program on fertility is very much influenced by economic conditions and urbanization levels. The Indian family planning program has been in operation over three decades and during the past ten years has also encouraged social marketing of Nirodh (condoms) and involvement of voluntary organizations and private medical practitioners in the program. More educated, better motivated couples can be expected to be drawn to the nongovernmental sectors where the quality of the services and

Table 6.9 Partial Correlation Coefficients of Total Fertility Rate (X_{10})^a and Total Marital Fertility Rate (X_{11}) with Effective Couple Protection Rate (X_7) and Contraceptive Prevalence Rate (X_8), controlling for other variables

Dependent Variable TFR (X_{10})			Dependent Variable TMFR (X_{11})			
A. Predictor Variables			B. Predictor Variables			
with X_7 & sequentially controlling for others	Partial r	R²	with X_7 & sequentially controlling for others	Partial r	R²	
	$X_{10} \circ X_7$	-0.470	0.22	$X_{11} \circ X_7$	-0.539*	0.29
	$X_{10} X_7 \circ X_1$	-0.668**	0.46	$X_{11} X_7 \circ X_1$	-0.645*	0.46
	$X_{10} X_7 \circ X_1 X_2$	-0.647*	0.48	$X_{11} X_7 \circ X_1 X_2$	-0.681*	0.72
	$X_{10} X_7 \circ X_1 X_2 X_3$	-0.381	0.53	$X_{11} X_7 \circ X_1 X_2 X_3$	-0.466*	0.74
	$X_{10} X_7 \circ X_1 X_2 X_3 X_4$	-0.004	0.80	$X_{11} X_7 \circ X_1 X_2 X_3 X_4$	-0.383*	0.74
	$X_{10} X_7 \circ X_1 X_2 X_3 X_4 X_5$	+0.002	0.83	$X_{11} X_7 \circ X_1 X_2 X_3 X_4 X_5$	-0.414*	0.79
	$X_{10} X_7 \circ X_1 X_2 X_3 X_4 X_5 X_6$	-0.026	0.83	$X_{11} X_7 \circ X_1 X_2 X_3 X_4 X_5 X_6$	-0.439*	0.80
C. Predictor Variables			D. Predictor Variables			
with X_8 & sequentially controlling for others	Partial r	R²	with X_8 & sequentially controlling for others	Partial r	R²	
	$X_{10} \circ X_8$	-0.848**	0.72	$X_{11} \circ X_8$	-0.680*	0.46
	$X_{10} X_8 \circ X_1$	-0.889**	0.80	$X_{11} X_8 \circ X_1$	-0.654**	0.47
	$X_{10} X_8 \circ X_1 X_2$	-0.884**	0.80	$X_{11} X_8 \circ X_1 X_2$	-0.707**	0.74
	$X_{10} X_8 \circ X_1 X_2 X_3$	-0.844**	0.84	$X_{11} X_8 \circ X_1 X_2 X_3$	-0.586*	0.78
	$X_{10} X_8 \circ X_1 X_2 X_3 X_4$	-0.481	0.84	$X_{11} X_8 \circ X_1 X_2 X_3 X_4$	-0.764**	0.87
	$X_{10} X_8 \circ X_1 X_2 X_3 X_4 X_5$	-0.405	0.85	$X_{11} X_8 \circ X_1 X_2 X_3 X_4 X_5$	-0.727*	0.88
	$X_{10} X_8 \circ X_1 X_2 X_3 X_4 X_5 X_6$	-0.365	0.86	$X_{11} X_8 \circ X_1 X_2 X_3 X_4 X_5 X_6$	-0.726*	0.88

^a For a description of variables, see notes to Table 6.7

* Significant at 5% level

** Significant at 1% level

Notes: TFR = total fertility rate; TMFR = total marital fertility rate

follow-up care are better than in the government sector. Hence, the future impact of the family planning program on fertility can be expected to be higher if the policy of encouraging voluntary organizations and the private sector in family planning is pursued more vigorously. Such a conclusion finds validation from the fact that the correlation coefficients of TMFR and TFR are systematically higher with the CPR than with the CEP, even after controlling for socioeconomic and health-related variables.

The partial correlations of TFR with contraceptive use leads to some interesting conclusions. The correlation coefficient of TFR with CPR is quite high, higher than that of TMFR with CPR, and significant even after controlling for the variables X_1 , X_2 , & X_3 representing economic growth and urbanization. However, as soon as we control for female literacy, the partial correlation coefficient (fourth order) becomes statistically insignificant. This indicates that the component of fertility contributed by nuptiality factors (age at marriage and proportions married in different ages) is affected very strongly by female literacy. Female literacy seems to influence fertility at the marital fertility level as well as through nuptiality patterns. This can also be seen from the highly significant ($r = -0.78$) zero order correlation coefficient between age at marriage (X_9) and contraceptive use (X_8). The partial correlations of TFR (X_{10}) with effective couple protection from the program is always less than of TFR with CPR as a whole, at all orders, implying that fertility is influenced more by total use than by use only via the program. Further, the effect of program use on fertility seems to depend on economic conditions and urbanization. The more advanced a state is in terms of per capita income and urbanization, the more significant seems to be the impact of the family planning program on fertility. From the analysis above the following conclusions emerge:

1. Marital fertility in Indian states seems to be influenced significantly by total contraceptive use, within and outside the program, even after controlling for all social and economic variables considered.
2. When we consider the total fertility rate--the combined effect of marital fertility and the nuptiality pattern, we find female literacy playing a significant role, suggesting that its impact on fertility is reflected more through increasing brides' age at marriage than directly on marital fertility, although the later effect is also significant.
3. The effective couple protection rate from within the program also seems to be influenced significantly by female literacy and infant mortality, indicating that the extent of contraceptive protection the program offers is influenced by women's status and child survival.
4. The importance of the nuptiality factor on future fertility trends in India has yet to be fully recognized. This factor, represented by the variable X_9 (proportion of married women aged 15-19), has a significant impact on fertility and is highly influenced by

female literacy. The component of reduced fertility, from natural fertility levels, due to nonmarriage can be measured by the ratio of TFR to TMFR and, following Bongaarts model, is the C_m factor. The lower this proportion, the higher is the effect of nuptiality on fertility. Table 6.7 shows this ratio for India is 0.74. The impact of the nuptiality factor in India is to reduce natural fertility by 26 percent. The impact is greatest in Kerala with 54 percent reduction in natural fertility due to the nuptiality factor and minimal in Uttar Pradesh, where only a 17 percent reduction is attributable to nuptiality patterns. Thus, future Indian fertility reductions, especially in states where age at marriage is low, will be realized as much by increasing age at marriage as by controlling fertility through contraception within marriage.

5. The social variable most significantly correlated with increased age at marriage is female literacy, also highly correlated with infant mortality. Thus, any programs for improving female literacy will simultaneously tend to raise brides' age, increase contraceptive use among the married, and contribute directly to reductions in infant mortality, thereby contributing to further indirect reductions in marital fertility. Female literacy seems to hold the key for demographic transition in India.
6. It has been argued in the demographic literature, from an analysis of the nature of fertility transition in developing countries (Srinivasan and Pathak, 1981), that fertility transition occurs in two stages: first, through increased contraceptive use among married women to achieve desired family size, and second, through a substantial increase in women's age at marriage and a diminished family size norm leading to the second wave of reduced marital fertility. The increase in brides' age is related to women's status in society; a key factor contributing to their social status is education. Kerala has long enjoyed older ages for brides and small family norms for historical and cultural reasons, and through contemporary policies, higher female literacy and status; Kerala's demographic transition can largely be attributed to this factor. While family planning programs can certainly contribute to reducing marital fertility in other states, programs for improving women's status through education seem to be the key for successful transition to replacement levels of fertility in less developed states.

SPACING AND LIMITATION PATTERNS

Two dimensions of fertility must be studied to understand the nature of changes in fertility over time or the fertility differentials existing across various population groups. These dimensions are the tempo and quantum of fertility--the patterns of spacing and limiting births. They are measured by the indicators of the interval between two successive births (or closed birth intervals) and parity progression ratios or the probability that a woman of a given parity i will ever proceed in her lifetime to the next parity $i+1$. Studies in India on these dimensions reveal some interesting findings.

Tempo

The average spacing between successive births in India even where fertility levels were comparatively higher, as in north India, was quite acceptable, even by contemporary health

standards, with an interval of approximately three years. This spacing was achieved not by any deliberate contraceptive practices but by the observance of religious and traditional cultural practices, such as the new mother's staying at her parent's home for a lengthy period after each delivery, periodical abstinence for religious reasons, and the joint family system that reduces the extent of communication and contact between the spouses. With modernization, the traditional-cultural factors that kept birth intervals fairly wide have been weakened, and there is a trend for the intervals to become shorter, unless appropriate spacing methods are used (Srinivasan, 1980).

Quantum

The parity progression ratio or the probability that a woman of a given parity ever proceeds to the next higher parity remains quite high in India, even for higher orders of birth. Indian fertility levels were high, not because women did not space their births adequately, but because they did not limit family size. Women were progressing rather slowly in their family building, but very steadily, and true to the adage that "slow and steady wins the race," ended with higher fertility. We can estimate parity progression ratios from cohort data on completed birth histories. Cohort parity progression ratios cannot be used to measure change in different periods of time.

Analytical studies of birth intervals reveal that the last closed birth intervals (the time between the last and next to the last birth) for married women in reproductive ages surveyed at one time can be used to measure birth-spacing patterns in the recent past. Similarly, open birth intervals can be used to measure period-specific parity progression ratios (Srinivasan, 1980). Open birth intervals are direct functions of the parity progression ratios that can be estimated, under some assumptions, from their mean and variance values and also by using information on the distribution of the last closed birth intervals. That open intervals are functions of parity progression ratios (PPR) is intuitively obvious because when women limit their family size with a particular parity, that child remains the mother's last child, and the open interval measured as the period of time from that child's birth to the date of the survey will record an increase at any future survey of the mother reflecting the decline in the PPR values. Since PPRs influence to a greater degree the overall fertility levels of the population, than do the spacing patterns as indicated above, they also become highly correlated with fertility levels. The longer the open birth intervals, the lower will be the fertility levels. Studies have also shown that when spacing patterns do not change drastically, the percentage increase in the open birth intervals in the same population over time is a good approximation of the changes in general marital fertility rates (Srinivasan 1980).

Tables 6.10 and 6.11 contain data on the mean values of the birth intervals computed from different surveys in selected Indian states at different times under different fertility

levels. Comparable interval values are provided for Fiji from the 1974 World Fertility Survey and for the U.S.A. from the public use sample of the 1970 census. The birth-spacing pattern hardly differed among the developed (U.S.A.) and developing countries (Fiji and India) and among states at different levels of fertility (Table 6.10). Major differences in length of open intervals are seen (Table 6.11). For example, the average open interval for U.S. women of parity 2 in 1970 was 83.3 months, compared to 67.0 in Goa in 1985, 42.5 in Fiji in 1974, and 29.1 months in Uttar Pradesh in 1978, reflecting the differentials in their TFR values. On the other hand, spacing between the second and third births for American women was only 3.9 more months compared to women in Goa, 6.4 for Fiji women, and 6.3 months for Uttar Pradesh women, hardly reflecting the magnitude of differences in their fertility. This analysis indicates that if contraception is not used in the future in India for spacing, there is a likelihood of birth intervals becoming shorter and contributing to higher risks to maternal health and child survival.

RECENCY OF BIRTH AND CONTRACEPTIVE USE

The contraceptive prevalence rate (CPR) measures overall use of contraception in the population. The impact on fertility of contraceptive use depends not only on the number and percentage of couples using it, but also on the characteristics of users and methods. The characteristics usually felt to influence the fertility impact of contraception are the age and parity of women using contraception and the type of method used. The younger the users and/or the lower their parity, the greater the impact of use on fertility because the age pattern of the fertility curve peaks in the 20-24 age group and declines thereafter.

In India, as mentioned in the previous chapter, there has been only a slow shift in the age and parity distribution of contraceptive acceptors despite a substantial increase in the overall contraceptive prevalence rate. Only 23 percent of currently married women aged 20-24 used contraception, compared to about 65 percent aged 35-39 (Table 5.9). Only 24 percent of the couples with one surviving child used contraception in 1988, compared to over 60 percent of those with three or more children. There are also considerable interstate variations in the characteristics of acceptors in India, with couples from Kerala accepting all methods of family planning at younger ages and lower parity compared to the rest of the country. Some Indian states have high contraceptive use coupled with higher crude birth rates or total fertility rates than would be expected (Table 6.7). For example, in Punjab, the 1988 contraceptive prevalence rate was as high as 69.3 percent, but the 1989 total fertility rate was 3.3 whereas Tamil Nadu and Andhra Pradesh had lower total 1989 fertility rates of 2.5 and 3.1 respectively with lower 1988 couple protection rates of 59.3 and 50.3 percent.

**Table 6.10 Mean Values of Last Closed Birth Intervals Compiled from Survey Data:
Selected States in India, Fiji, and the United States, 1965-85**

Country/State Year	Birth Interval by Parity of Mother							TFR in Survey Year
	0-1	1-2	2-3	3-4	4-5	5-6	7+	
Bihar, 1980	39.4	39.4	40.1	42.3	40.8	40.5	39.5	5.7
Goa, 1985	33.3	39.5	39.3	37.3	36.9	36.4	35.0	2.5
Orissa, 1982	40.8	40.1	39.6	38.2	38.8	36.0	35.9	4.3
Rajasthan, 1981	34.8	34.8	34.0	35.7	34.4	36.3	35.8	5.2
Tamil Nadu, 1965	34.5	35.5	37.5	37.7	40.5	38.4	35.8	4.5
Uttar Pradesh, 1978	37.8	37.1	36.5	36.7	36.7	36.1	34.5	5.6
Fiji, 1974	25.1	32.7	36.4	36.1	37.6	35.7*	---	3.5
U.S.A., 1970	35.0	38.3	42.8	40.2	37.3	34.5	34.8	1.9

*For parity 6 and above

Sources: Hastings and Robinson, 1975; Srinivasan, 1980; Srinivasan and Kanitkar, 1984

Table 6.11 Mean Values of Open Birth Interval, Selected States in India, Fiji, and the United States, 1965-85

Country/State Year	Birth Interval by Parity of Mother							TFR in Survey Year
	1	2	3	4	5	6	7+	
Bihar, 1980	31.4	34.1	40.0	43.0	45.2	47.5	50.0	5.7
Goa, 1985	61.0	67.0	80.9	88.0	95.8	96.9	105.5	2.5
Orissa, 1982	42.6	43.0	51.9	61.1	62.4	62.6	67.3	4.3
Rajasthan, 1981	27.7	28.7	31.7	33.1	36.5	45.1	56.2	5.2
Tamil Nadu, 1965	41.1	40.1	44.1	47.3	39.0	47.1	46.0	4.5
Uttar Pradesh, 1978	27.4	29.1	33.0	33.5	39.7	42.6	47.7	5.6
Fiji, 1974	49.9	42.5	41.5	47.4	54.2	57.8 ^a		3.5
U.S., 1970	82.0	83.3	76.4	69.2	64.1	56.4	46.0	1.9

^aFor women of parity 6 and above.

Source: Hastings and Robinson, 1975; Srinivasan, 1980; Srinivasan and Kanitkar, 1984

In many countries a large proportion of the differential impact of contraceptive use on fertility can be traced to a differential in the fertility potential or fecundity status of the couples using contraception and the method-mix of contraceptive usage. It is logical to expect that the impact on fertility would be higher when highly fecund couples use very effective contraception than when an equal number of less fecund couples are protected by less effective methods in the same population. Two extreme situations may be conceptualized for an illustration. Assume that India's general marital fertility rate in the absence of any contraception is around 250 per 1000 married women in the reproductive ages (or 25 percent). Suppose in any year t one can identify and protect by contraception this 25 percent of the couples who are going to have a birth in year $t+1$ (assuming that one can identify such women beforehand), one can have zero fertility in year $t+1$ even with a 25 percent contraceptive prevalence rate. On the other hand, in year t , if only the remaining 75 percent of the couples, who are not going to have a birth in year t were protected, the fertility in year $t+1$ may not be affected at all. Thus, we can visualize two extreme situations, one in which a CPR of 25 percent leads to a fertility of zero and another with a CPR of 75 percent, which would not affect fertility at all (250 GMFR) in year $t+1$. Of course this situation is not a stable one that can continue over time, but it highlights the need for concentrating family planning program efforts on highly fecund women, carefully selected from among the eligible couples, and protecting them effectively, rather than on all women in the reproductive ages uniformly, as it is done at present. Fertility does not occur at random with uniform probability in all women of reproductive age.

An analysis of the data on maternity and pregnancy histories of women in developing countries suggests that one of the powerful indicators for identifying women with high potential fertility is recency of a birth. Mothers who have births in any year t are self-selected for higher fecundity in future years. This is fairly obvious from the emphasis gynecologists place on past pregnancies or births in treating infertility. To test the differentials in the subsequent fertility of women who had a birth in the year t (index year) compared with those who did not have a birth that year, the 1976-79 World Fertility Survey data for Nepal, Sudan, and Bangladesh were analyzed. For comparison, data from a large-scale sample survey in Goa made by the International Institute for Population Sciences, Bombay, during 1985-86 (Roy et al., 1985) were also analyzed. All four data sets included women married over five years at the survey time, currently and only once married, and within the reproductive ages. The fertility histories of women in the subsequent five-year period $t+1$ to $t+5$ were compared between women who had a birth in the index year t and those who had no birth. The analysis was done separately for ever users of contraception, never users, and all women (Table 6.12).

Clearly women who gave birth in year t had consistently higher fertility in the years $t+1$ to $t+5$ than women who did not give birth in year t . For example, in Goa, of 2,162 women surveyed in 1985, married more than five years, 365 gave birth in 1978, and 1797 did not. The former group had an average of 0.84 children in 1979-83 compared to 0.52 children for the latter group during that period, indicating that women with 1978 births had, in the next five years, 58.5 percent higher fertility than women who had no 1978 births. The four areas included in Table 6.12 have different levels of contraceptive use and fertility but even under these conditions, women who gave birth to a child in any year subsequently had higher fertility than women who did not give birth in that year. This is true for ever and never users of contraception, separately for all areas, except for ever users in Nepal. The higher fertility of those who had births than those who had none in a year, when assessed over the subsequent five-year period for nonusers, ranged from 10.1 percent in Bangladesh to 47.4 percent in Goa. The direction of these differences persisted even after controlling for age and parity of the two groups of women at time t .

Thus, there seems to be empirical evidence in favor of concentrating family planning program efforts among those women who have had a child in a year rather than on all women in the reproductive ages. This plan would ensure targeting scarce program resources on the most fecund couples and maximizing the impact of contraceptive use on fertility in subsequent years. This scheme is called a birth-based approach in the literature (Srinivasan and Freymann, 1989). The index of contraceptive protection offered to women classified by recency of birth (or open birth interval) becomes a more meaningful measure on the impact of fertility in such a situation. A birth-based approach to the program helps target efforts to potentially more fecund couples and can achieve a larger impact on fertility for any given level of couple protection rate.

Table 6.12 Births per Married Woman over Five Years (t+1) to (t+5), with Birth or No Birth in Year "t": Nepal, Bangladesh, Sudan, and Goa, 1970-78

Country & Contraceptive Use Status ^a	Reference Year "t"	Average No. Births per Woman in Five Years (t+1) to (t+5) ^b			
		With Birth in Year "t"	With No Birth in Year "t"	No Births, Births Combined	% Excess Fertility: Women with Birth vs. No Birth, Year "t" ^c
Goa (India) Ever Users (57%)	1978	0.81 (201)	0.48 (1040)	0.53 (1241)	68.8
Never Users (43%)	1978	0.87 (164)	0.59 (757)	0.64 (921)	47.4
All (100%)	1978	0.84 (365)	0.53 (1797)	0.58 (2162)	58.5
Bangladesh Ever Users (20%)	1978	0.84 (365)	0.53 (1797)	0.58 (2162)	58.5
Never Users (80%)	1970	1.31 (1028)	1.19 (2491)	1.23 (3519)	10.1
All (100%)	1970	1.31 (1325)	1.20 (3056)	1.23 (4381)	9.1
Sudan Ever Users (18%)	1973	1.39 (1.42)	1.21 (266)	1.27 (408)	14.9
Never Users (52%)	1973	1.56 (583)	1.18 (1637)	1.28 (2628)	28.8
All (100%)	1973	1.52 (725)	1.18 (1903)	1.28 (2628)	28.8
Nepal Ever Users (5%)	1970	1.22 (65)	1.37 (142)	1.32 (207)	-10.9
Never Users (95%)	1970	1.36 (992)	1.19 (2842)	1.23 (3834)	14.3
All (100%)	1970	1.35 (1057)	1.19 (2984)	1.23 (4041)	13.4

^aNumbers in this column are percentage of married women in this study who ever or never used contraceptives.

^bNumbers in parentheses in these columns are the number of women on whose experience the average number of children born during (t+1) to (t+5) was estimated.

^cCompiled by subtracting percentage with no births from percentage with births, multiplying result by 100, and dividing that result by no birth figure

Source: World Fertility Surveys in Bangladesh, Nepal and Sudan (1976, 1977, 1979) and Goa Fertility Survey (1985)

Chapter 7

CASE STUDIES OF THREE SUCCESSFUL FERTILITY TRANSITION STATES: GOA, KERALA, AND TAMIL NADU

The Indian population has a considerable degree of heterogeneity in its cultural history, traditional values, and norms as they influence nuptiality patterns, family sizes, contraceptive use, and fertility behavior. The impact of differences in cultural and traditional factors is also reflected in variations in natural fertility in different areas of the country (see Chapters 3 and 6). Significant differences exist in the status of women especially between the southern and northern states, and among religious groups as reflected in the age at marriage of women and men, the value placed on the male child, and the significance attached to concepts such as celibacy, abstinence within marriage, and terminal abstinence of couples after a certain age or stage in the life cycle when they consider it shameful to have a baby. These traditional values that kept fertility moderately high for centuries are breaking down at different paces in different states. The process of modernization has been found to reduce or narrow the influence of various traditional factors with regard to contraceptive use and fertility.

Various developmental programs undertaken in India since independence have had significant impact on industry and agriculture but fall short of the desired goals and targets, and in comparison with many other developing countries, India trails in social development, especially education and status of women. Impacts of development programs also vary from state to state. Family planning programs, even if implemented with uniform inputs and efficiency throughout the country, generate interstate and interregional differentials in contraceptive acceptance, use, and fertility change.

In this context, it is useful to keep in mind the prevailing political and bureaucratic system in India that has a strong impact on the family planning program and demographic trends in the country. India is a federal democratic nation, a union of 25 states and 7 union territories (Figure 7.1). The head of the nation is the president in whom all executive powers are vested. According to constitutional provisions and by practice, the president functions under the advice of a council of ministers--the cabinet, headed by the prime minister. The cabinet conducts the affairs of the union government in the name of the president. The prime minister who is the elected leader of the majority party in the Lok Sabha (lower house of parliament, corresponding to the British House of Commons) is the supreme political leader of the nation. Execution of various governmental functions is

through the central bureaucracy which retains in principle, the methods of the British Civil Service, virtually as it was at the time of India's political independence in 1947. There are chains of supervision and control of every activity at each level; decision making is defused and delayed.

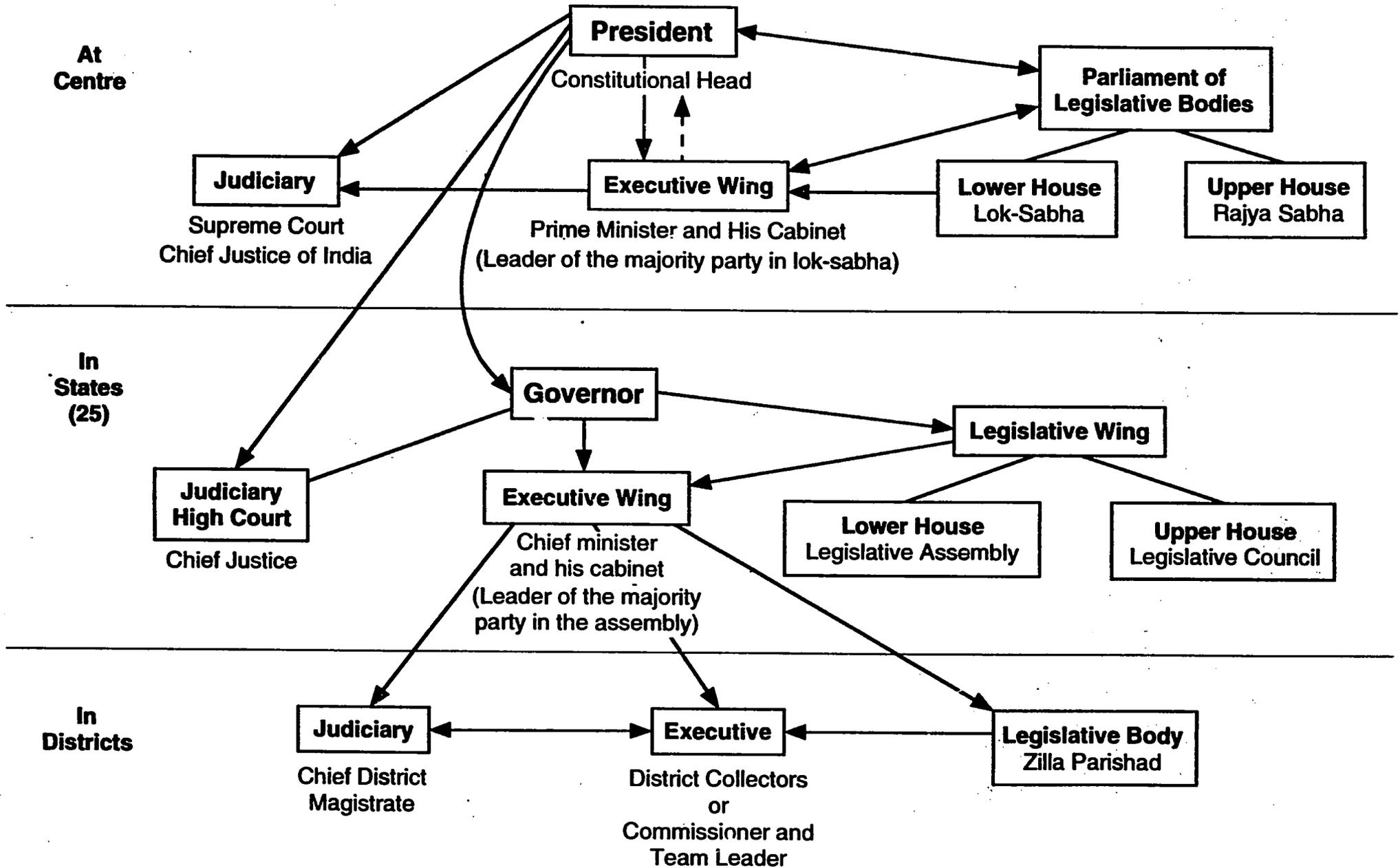
State political systems are similar to the one at the central level. For each state, the president appoints a governor as executive head for a five-year term. The governor acts on the advice of a council of ministers headed by the chief minister who is the elected leader of the majority party in the state legislative assembly (corresponding to the Lok Sabha). Again the day-to-day functions of the administration are carried out by the bureaucratic system.

Each state is divided into districts as the administrative units. Below the district level come the towns, the teshils or talukas, the blocks, and the villages. These units function as local self-government branches, with different degrees of autonomy and responsibility assigned by the state government. In implementing union- and state-level policies and programs, the district-level team forms the basic unit of administration in all states. The district collector, district development officer, district commissioner, or district magistrate, as that person is variously designated in different states, is the chief executive officer of the district administration and at the cutting edge of the bureaucracy for all government developmental and welfare programs in India.

Some states have decentralized political power to the district level to locally elected leaders called Zilla Parishad. Many states, such as Maharashtra, Gujarat, and Karnataka have, by legislation, decentralized their power base to the Zilla Parishads whereby they have statutory and fiscal powers delegated to them in most areas of the government. In these states, the chief of the district bureaucracy functions as the executive officer of the Zilla Parishad.

Under the 1950 constitution, some functions--called the central list-- fall in the legislative and administrative domain of the central government. Subjects that fall wholly within the purview of the state governments, form the state list. Functions in the legislative and administrative purview of both central and state governments form the concurrent list. Primary and secondary education, public health and the social welfare programs are included in the state list. Population control and family planning programs are included in the concurrent list. Family planning is wholly funded by the central government, so population policies and the program are planned and funded centrally. However, since they have to be implemented as a part and parcel of health programs, the responsibility and authority for execution at the field level rests with state governments. The responsibility for effective program implementation for improving female literacy and universal primary education and

Figure 7.1
Political System in India



public health programs for sanitation, water supply, and disease control in all programs that contribute to the successful implementation of family planning rest with the state governments, although for some of these programs central assistance is provided. The political will of the parties in power and the efficiency of the bureaucracy at the state level are the key determinants of the success of those programs that lie within the domain of the state government.

Family planning programs work best in societies that give no special preference and treatment to the male child, where women's status is quite high, educational programs for children--especially girls--have been universalized, and public health and development programs have been successfully implemented to reduce general and infant mortality. In such favorable social settings, family planning programs will have substantial impact on fertility even when they concentrate on the supply side of the fertility regulation, offering easily accessible, high-quality services. The motivational or the demand-generation side of fertility regulation, in such a situation, is largely taken care of by the favorable cultural milieu and the state's successful educational and public health programs.

On the other hand, when the cultural milieu operates against the equality of women, and developmental efforts, especially in education and public health, are not implemented effectively by the state government, family planning programs have to work against the current, burdened with motivating couples to adopt a small family norm, while also supplying high-quality, easily accessible contraceptive services. Motivational tasks of family planning programs become increasingly severe in states or regions lacking political will or bureaucratic efficiency, where a traditional culture survives and developmental efforts have not progressed. The crucial role of state governments for effective and efficient implementation of family planning programs in India is not fully appreciated.

Cleland (1990) argues that the ideational or motivational aspect of family planning programs in developing countries has not been fully appreciated and quantified. The power of the media and the health information, education, and communication (IEC) programs in altering the desired family size norm and contraceptive behavior, even in remote rural areas not exposed to modern education, is not yet fully understood. To what extent will a national mass media campaign through cinema, radio, and television alter perceptions about having only one or two children as being best for a couple, alter desired family size? To what extent is a family size norm or desired family size rooted in the sociocultural structure of the society and to what extent can they be influenced by propaganda machinery and direct educational interventions by the family planning ministry?

These questions assume enormous importance in the context of modern satellite technology and transnational communication strategies. Social scientists may argue that such important aspects of human attitude and behavior as family size norms and human

reproduction will be linked strongly to cultural values, traditional norms, and social structure, rather than being a temporary, adaptable, malleable value that can be influenced by direct media propaganda or educational programs, similar to the sales techniques used to promote a brand of soap or breakfast cereal. The experiences with family planning programs in a number of developing countries indicate that while both the sociocultural structure and developmental context do influence desired family size and fertility behavior, family planning programs, especially the components of political will, IEC, and service delivery (providing easily accessible, high-quality services and a variety of methods) do have an independent impact on the family size norm and fertility behavior. How else can one explain the dramatic change in family size norm and fertility decline by almost 50 percent from 1978 to 1985 in such a large population of more than one billion in the People's Republic of China?

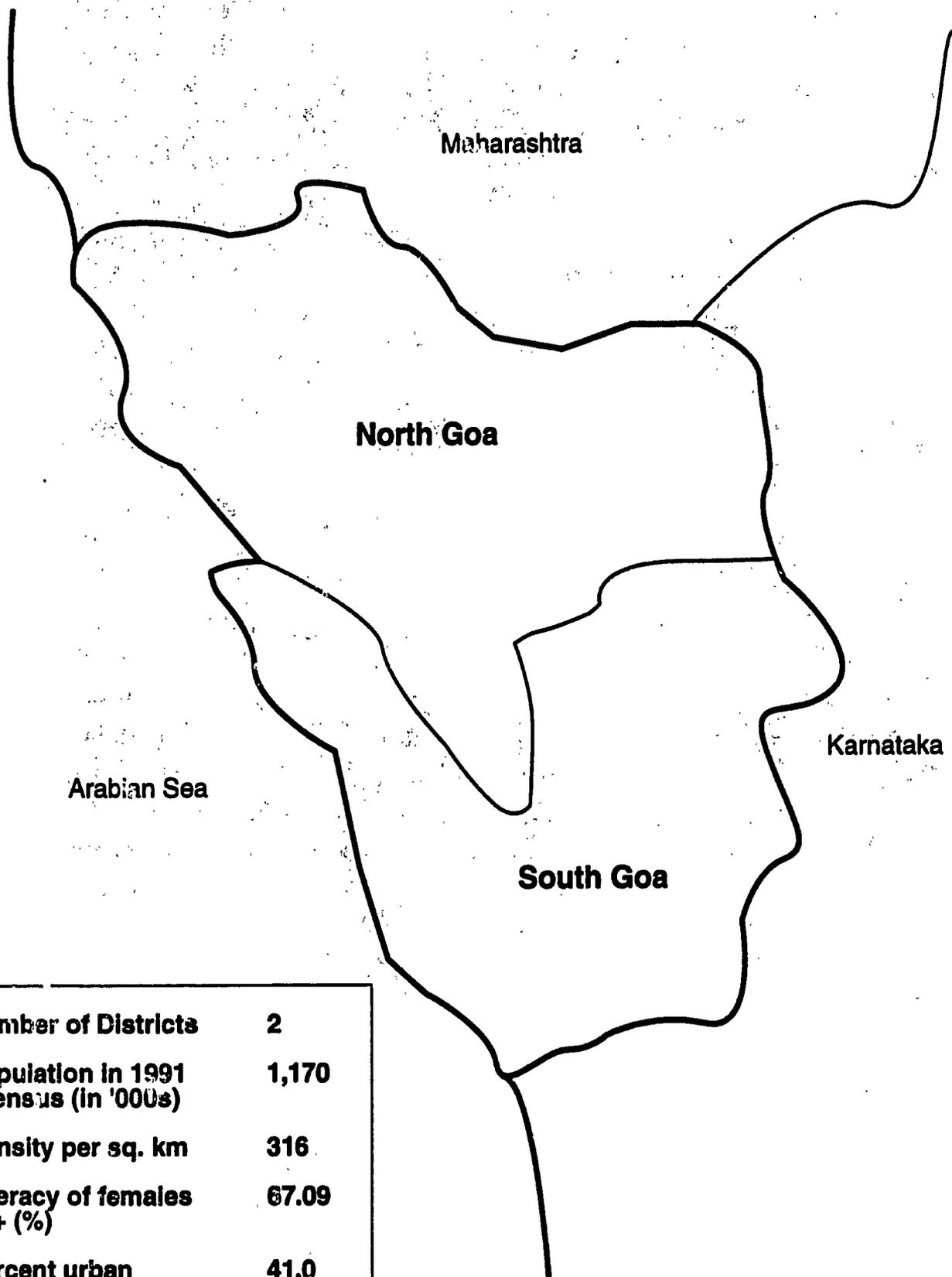
The experiences in those areas or states in India that have undergone successful fertility transition in recent years also indicate the power of certain types of social influences that can be brought to bear in bringing about rapid fertility declines. Four such forces can be identified:

1. policy environment that includes political will and strategic planning
2. bureaucratic efficiency, including management skills and IEC activities
3. social change with special emphasis on improving the status of women and child survival
4. economic growth with reduction in economic disparities.

When one or more of these influences operates strongly and is sustained for a certain length of time in the society, family size norms change, contraceptive practices spread rapidly, and fertility tends to decline sharply. The routes to successful, rapid fertility transition are many; they can differ from society to society and can be influenced by different mechanisms of social engineering. It is not necessary that a population be economically advanced, as in Western societies, or urbanized to a large extent, or largely employed in nonagricultural occupations to enjoy the fruits of low mortality, high life expectancy, and low fertility--in general, a better quality of life under limited material circumstances.

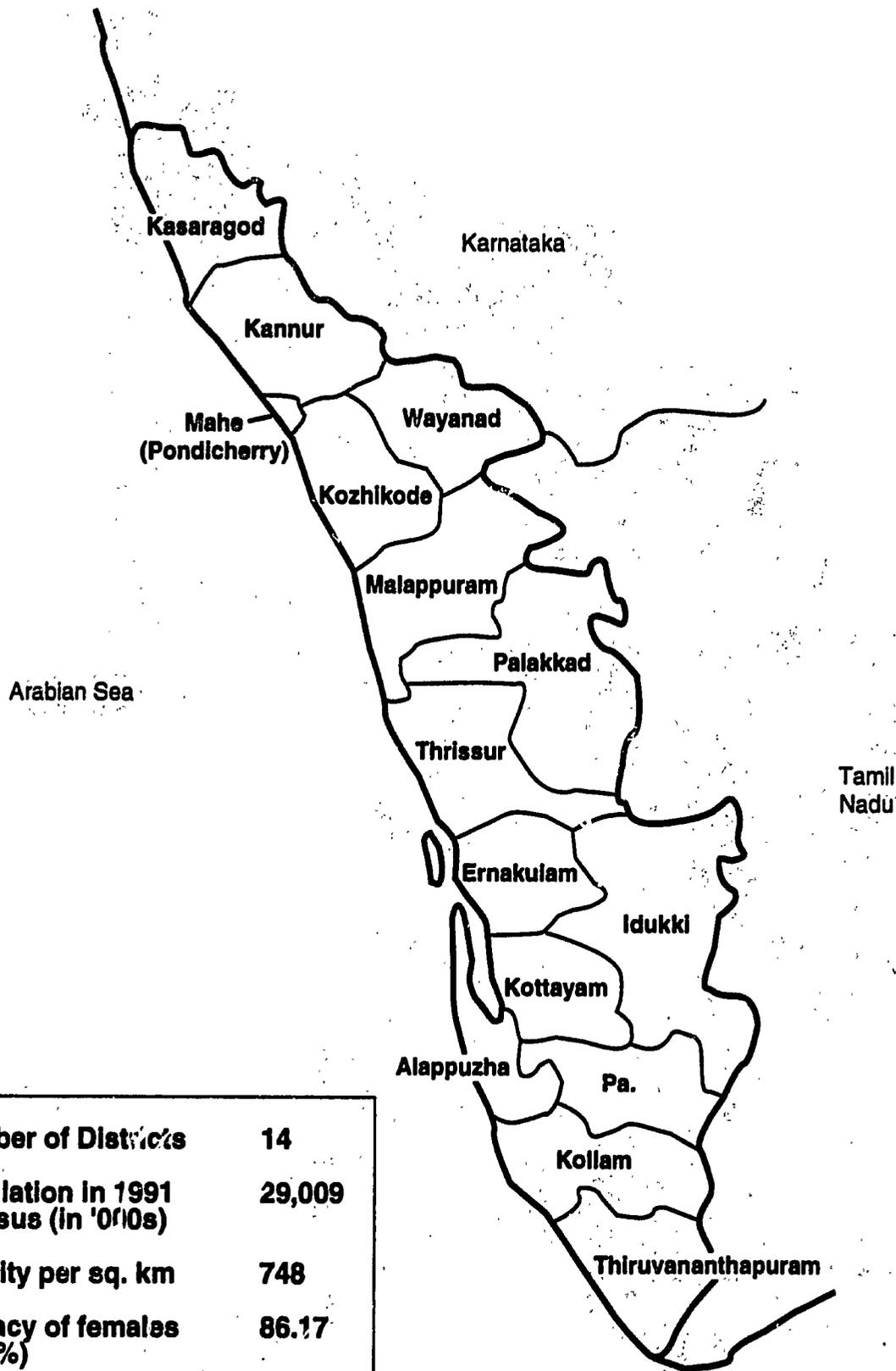
This chapter proposes to identify and elaborate on the nature and extent of these forces or influences as they operate in three states in India that have recently achieved or are rapidly on their way to successful fertility transition--Goa, Kerala, and Tamil Nadu. A

Figure 7.2
Goa



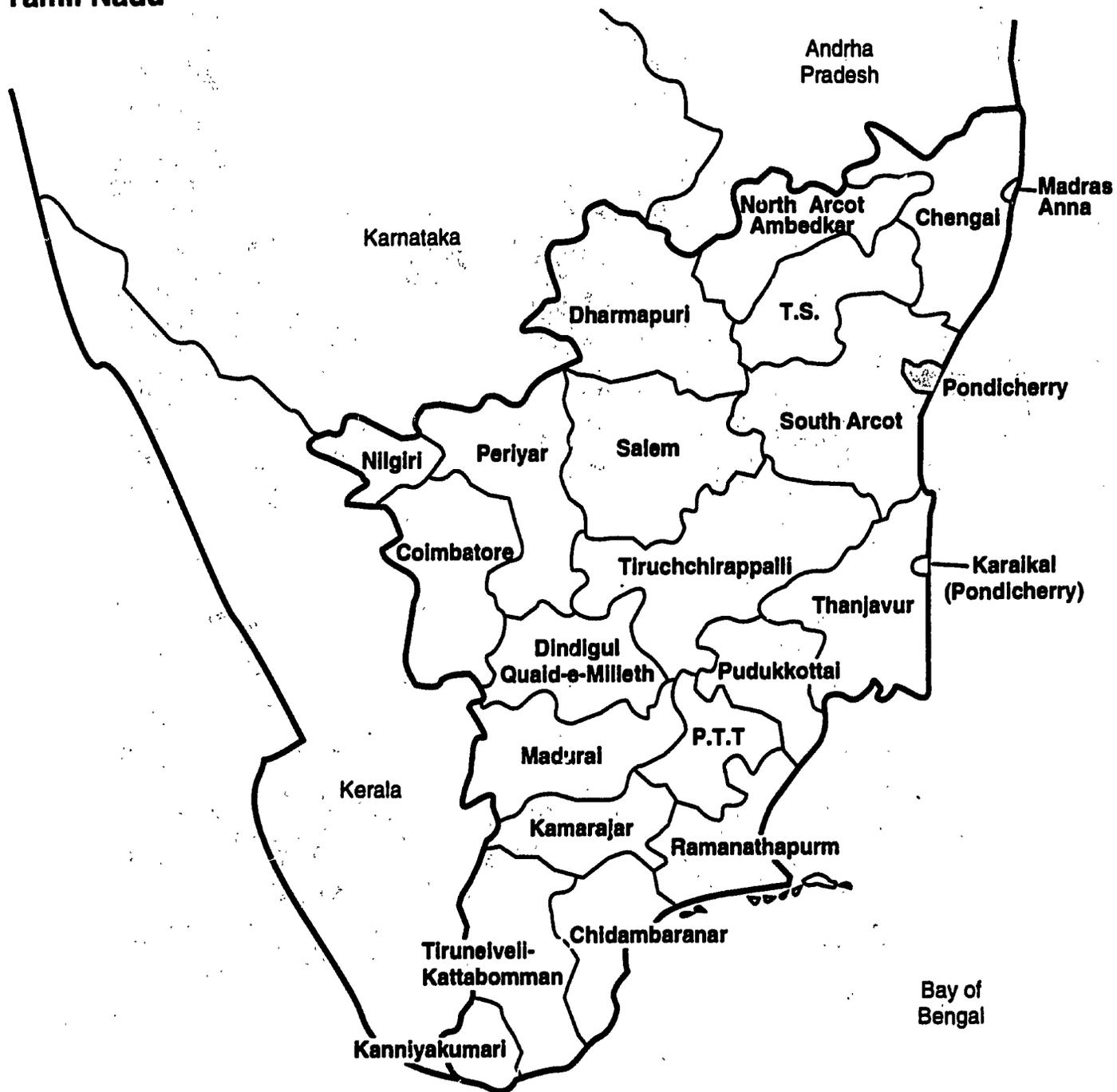
Number of Districts	2
Population in 1991 census (in '000s)	1,170
Density per sq. km	316
Literacy of females 7+ (%)	67.09
Percent urban	41.0

Figure 7.3
Kerala



Number of Districts	14
Population in 1991 census (in '000s)	29,009
Density per sq. km	748
Literacy of females 7+ (%)	86.17
Percent urban	25.3

Figure 7.4
Tamil Nadu



Number of Districts	21
Population in 1991 census (in '000s)	55,859
Density per sq. km	429
Literacy of females 7+ (%)	51.33
Percent urban	34.2

macrolevel case study emphasizing the factors, policies, and programs from above and how they have contributed to rapid diffusion of family planning ideas, contraceptive practice, and sustained fertility decline will shed light on the underlying dynamics of fertility transition in these states. The objective is to draw lessons for policy and program implementation for the other areas of the country that have not been so successful in fertility transition despite long-standing official family planning programs.

THE CASE STUDY OF GOA

Background

The territories of Goa, Daman, and Diu lie on the western coast of the Indian peninsula on the borders of Maharashtra. They were under continuous Portuguese rule from 1510, a few years after the visit of the famous Portuguese maritime explorer, Vasco de Gama, until they were liberated in December 1961 and became an integral part of the Indian union. Among these three separate land areas, Daman and Diu are located near Gujarat north of Bombay while Goa is located about 300 miles south of Bombay on the coast of the Arabian Sea. Among these three areas colonized by the Portuguese, Goa comprised 97 percent of the total area and 93 percent of the population at the time of liberation. After liberation, for over two and a half decades, the three areas were administered as a Union Territory, under the direct supervision of the central government in Delhi. In May 1987 Goa was legally constituted a separate state while Daman and Diu continue as union territories, governed by the central government.

Goa is the smallest state in the Indian union with a land area of 3700 sq. km and a population of 1.170 million (1991 census). Since it was under Portuguese rule for 450 years, the impact of Portuguese culture in art and architecture, music and dance, and life-styles of the people are apparent even to casual visitors to this state. The Portuguese rulers, who were Roman Catholics, made tireless efforts to convert the entire population of Goa to their religion and also to adopt their habits of food, dress, music, and social behavior. Those who embraced Christianity were suitably rewarded by lucrative jobs, possibilities of higher education in Portugal, and even recognition as full-fledged Portuguese citizens. Marriages between the Portuguese settlers and the local people were encouraged. Laws enacted for compulsory registration of births, deaths, and marriages in Goa, Daman, and Diu were strictly enforced. Records of baptisms, marriages, and deaths maintained by Goa parishes for over a hundred years are of high quality and have been used for a number of historical demographic analyses (D'Souza, 1975; Srivastava, 1980). The Christian way of life such as obeying government rules and regulations, attending church and church-related functions, and maintaining accurate family records of births and deaths is widely prevalent in Goa. Because

of such a long association with the Portuguese and adoption of Western culture and Christian ways by a large section of the population, even the non-Christian Goanese people have, by and large, developed Western habits of dress, music, dance, diet, sanitation, hygiene, and other ways of life.

The living standards of an average Goanese were far higher than those of the average Indian, even before independence, although not comparable to Portuguese and European standards. Many Goanese men worked in Portuguese territories in Africa and regularly remitted substantial sums of money to their families in Goa. Salaries of civil servants and persons employed in the Portuguese government departments and army stationed in Goa were far higher than those paid by the British to Indians in British India. Because of its coastal location on the Arabian Sea and its scenic beauty, Goa became a regular holiday resort for Portuguese gentry and Mormugao Port (discovered by Vasco de Gama) developed into a big coastal town. Goa can boast of a number of old churches of great architectural value and religious significance. The mortal remains of many great Catholic saints including those of St. Xavier are buried in Goa's capital, Panjim, and attract millions of Christians from within and outside India to visit Goa as a sacred place. Goa has a substantial income from tourists visiting for religious or vacation purposes.

The status of women has also been quite high in Goa, compared to the rest of India. The strong preference for a male child, pervasive among the Hindus in India, is not observable to the same extent even among Goanese Hindus and much less among the Christians, although son preference does exist. Female literacy and educational levels are substantially higher in Goa than in the rest of India. Bride's age is higher and a high proportion of women are employed in the organized sector. Mortality levels, at any time in recorded history, were lower in Goa than in adjacent Bombay, possibly because of strict sanitation and public health rules. These social and economic conditions are highly conducive for the adoption of small family norm.

Fertility began a slow decline in Goa long before the introduction of organized, official family planning programs in 1961, after it became a part of the Indian union. Despite the pervasive Roman Catholic culture in Goa, there has been no religious opposition to the use of artificial methods of family planning, either for spacing or family limitation; fertility levels among Catholics have been lower than among the Hindus and a significant proportion of Catholic couples use natural family planning methods (abstinence, rhythm, and coitus interruptus) with a remarkable effectiveness. The socio-cultural context, rather than the official family planning program, has been largely responsible for the rapid diffusion of a small family norm, the increasing practice of contraception, and a sustained decline in fertility in Goa. The official family planning program introduced in 1961 seems to have legitimized the norm and use of artificial methods of contraception and made many modern

methods, especially sterilization, easily available. Demographic and socioeconomic data for Goa are provided below, comparing it with the rest of India and Portugal--the model for Goa's demographic transition.

Population Size and Rate of Growth

The population of the Portuguese territory of Goa, Daman, and Diu as a whole grew rather slowly during the first six decades of this century. The average annual growth rate hardly exceeded 1 percent during this period and was consistently and significantly lower than what prevailed in India. During this period of 1901-51 the population of Goa grew at an average rate of 0.28 percent per year, the lowest compared to other states of India (see Table 4.2). This phenomenon is largely attributable to lower birth rates in Goa for reasons to be highlighted in the next section. After its integration with the Indian union in 1961, there was a sudden spurt of population growth in Goa which sustained for almost two decades before it began to decline. The average annual growth rate during 1961-71 was as high as 3.06 percent, 0.86 percentage points higher than India as a whole. In this century only, from 1961 to 1981, Goa experienced higher rates of population growth than the rest of India. Approximately 40 percent of the increase during this period is attributable to net in-migration to Goa from other states, especially from the adjacent Maharashtra (Roy et al., 1985). Population growth began to decline in 1968-69, recording an average annual rate of 2.37 percent in 1971-81 and 1.48 percent in 1981-91, 0.63 percentage points less than for all of India (Table 7.1).

Socioeconomic and Demographic Indicators

Goa had consistently higher literacy levels than most states. According to the 1991 census, the percentage of women aged 7 and above who were literate was 67.1 in Goa compared to 39.3 percent in the country as a whole and 86.2 percent in Kerala. The per capita net GDP in 1987-88 at constant prices was Rs. 3545 in Goa compared to Rs. 1910 for India and Rs. 1416 for Kerala. The length of roads available in Goa per 100,000 population was 350 km compared to 180 km for all India and 413 km in Kerala. The sex ratio (number of females per thousand males) has steadily dropped in Goa since 1921 when it was 1120; after liberation, it declined more rapidly during the next three decades to 967 in 1991, reflecting the sharply lower sex ratio among immigrants. However, even in 1991 the sex ratio of 967 in Goa was higher by 40 points than the all-India average of 927, but 69 points lower than Kerala's. The decline in Goa's sex ratio after 1961 can be attributed to large numbers of male migrants seeking employment in Goa. The International Institute for Population Sciences (IIPS) in Bombay surveyed about 3000 households, randomly selected following scientific sampling techniques from different parts of Goa (e.g., large cities, small towns,

Table 7.1 Population Growth Trends: Goa and India, 1901-91

Year	Population in 000s	Goa		India	
		Annual growth ^a	Sex Ratio ^b	Annual Growth	Sex Ratio
1901	475		1091		972
1911	487	+0.23	1108	+0.56	964
1921	469	-0.33	1120	-0.03	955
1931	505	+0.78	1088	+1.04	950
1941	541	+0.83	1084	+1.33	945
1951	547	+0.21	1128	+1.25	946
1961	590	+0.50	1066	+1.96	941
1971	795	+3.06	981	+2.20	930
1981	1008	+2.37	975	+2.22	925
1991	1170	+1.48	967	+2.11	927

^aAnnual growth = average annual exponential growth rate per 1000 since previous date

^bSex ratio = females per 1000 males

Source: India, Registrar General, 1991b

and villages) in 1985 (Roy et al., 1985). This survey found that in 1984, 93 percent of girls and 97 percent of boys aged 6 to 14 were attending school in Goa. Only 2 percent of Goanese females aged 15 to 19 were married compared to over 30 percent in the nation.

Goa's literacy rate was higher than India's at the time of liberation in 1961, although it was significantly lower than in Portugal and Kerala (Table 7.2). This is true for the total population aged 15 and above, as well as for females this age. Part of the reason for lower literacy in Goa in 1961 was that during the major part of the Portuguese regime in Goa, Hindus were discriminated against in education. The pace of increase in literacy in Goa after 1961 is higher than in the rest of the country, including Kerala. In 1991 among those aged 15 and above, literacy for the total population and females in Goa, Daman, and Diu differed by only four percentage points.

Educational policy was revised only around 1910 when education was made accessible to all, regardless of caste or creed. A number of schools used English as the means of instruction, but a student desiring to enter one had to pass the first standard examination of the Portuguese school (D'Souza, 1975). Higher education in English was not available and consequently a large number of Goanese seeking higher education in English left the territory.

Nuptiality Patterns

Age at marriage in Goa, Daman, and Diu is higher than in Kerala, and for men higher even than in Portugal in 1961 and 1971 (Table 7.3). Further, brides' age at marriage has increased over the years and in 1981 for Goa, it was the highest in the country.

The proportion of women remaining single was highest in Goa, compared to other Indian areas, although lower than in Portugal (Table 7.4). Since 1961, the proportion of women remaining single in Goa has declined. While Goanese women marry at increasingly later ages, a larger proportion of them, in comparison even to Kerala, remain single. Goa's greater female celibacy may be partly attributed to the influence of Catholicism, strongly promoted by the Portuguese rulers for over three centuries in their colony.

In the 1985 IIPS Bombay survey in Goa (Roy et al., 1985), even among illiterate women and those with no formal education, the average age at marriage was 18.3 years. The difference in marriage age between those lacking formal education and those who had completed high school (ten years or more of schooling) was more than five years. According to the 1981 census, the number of married women of reproductive age (15-44) in Goa was 154 per thousand population and according to the 1985 survey it was 136. Even in the highly fertile age group 20-29, only 44 percent of Goanese women were married

Table 7.2 Percentage Literate among Total and Female Population above Age 15: Goa, Kerala, India, Portugal, 1961-91

Region	Total Population				Female Population			
	1961	1971	1981	1991 ^a	1961	1971	1981	1991 ^a
Goa, Daman & Diu	35.7	50.3	60.6	82.4	25.8	36.0	47.0	78.4
Kerala	56.8	69.2	78.1	94.2	44.0	59.4	70.8	92.9
India	27.8	34.0	40.8	55.7	13.2	19.3	25.7	45.7
Portugal ^b	61.9	71.0	79.4	NA	55.4	65.3	74.6	NA

^aEstimated from 1991 census

^bValues refer to 1960 and 1970 respectively

Sources: India, Registrar General, 1964, 1974b, 1981a; *Census of India, Kerala, Reports and Tables Based on 5 Percent Sample Data, 1981*; UNESCO, Statistics of Educational Attainment and Illiteracy.

Table 7.3 Singulate Mean Age at Marriage: Goa, Kerala, India, Portugal, 1961-81

Region	1961		1971		1981	
	Male	Female	Male	Female	Male	Female
Goa, Daman & Diu	27.14	20.82	26.93	21.31	28.31	22.84
Kerala	26.34	19.98	26.74	21.01	27.19	21.85
India	21.59	15.85	22.36	17.16	23.27	18.32
Portugal	26.38	23.95	24.87	22.83	27.5 ^a	24.8 ^a

^a1988

Sources: Indian data: India, Registrar General, 1964, 1974b, 1981a; Portuguese data: UNDESA, 1964, 1984, 1991.

**Table 7.4 Percentage of Women Aged 45-49
Remaining Single: Goa, Indian States, India, Portugal,
1961-81**

Region	1961	1971	1981
Goa, Daman & Diu	6.53	3.95	3.27
Kerala	2.22	3.05	2.92
India	0.50	0.52	0.44
Portugal	15.93	12.07	NA

NA = not available

Source: Indian data: India, Registrar General, 1964, 1974b, 1981a; Portuguese data: UNDESA, 1964, 1984, 1991.

compared to 80 percent in the nation. Two factors responsible for Goa's lower fertility are older brides and more women remaining single throughout their lifetime--both attributable to Roman Catholicism and Portuguese rule in Goa.

Fertility and Mortality Trends

Historically fertility and mortality levels in Goa have been substantially lower than those of India. Lower fertility has been attributed to several factors, particularly women's relatively higher status in Goanese society because of education, higher brides' age, a higher proportion remaining single throughout life, long spells of separation because of husbands' leaving Goa for work (many in Portuguese colonies in Africa), and, as a consequence, a pervasive desire for a smaller family and adoption of contraceptive methods including effective use of traditional, natural methods (Pai Panandikar and Chaudhuri, 1983). In 1961, at the time of their integration with India, the territories of Goa, Daman, and Diu were 36 percent Christian (mostly Catholic) but the fertility levels of Christians and Hindus were lower than in the rest of India. Fertility and mortality in Goa seem to have followed trends similar to those in Portugal, with Goanese rates always higher than in Portugal.

Goa's crude birth rate fell sharply from 1961 to 1966, subsequently rose, and declined almost steadily after 1971, while the crude death rate fell by 5.8 points (Table 7.5). According to the 1985 IIPS Bombay survey in Goa (Roy et al., 1985), the 1982-83 CBR was 19.4, the general fertility rate of women aged 15-44 was 84, and the TFR was 2.6--all lower than the rates in Kerala during the same period. Goa's 1989 CBR was almost half India's crude birth rate and the crude death rate was 75 percent of the all-India level. Total Goanese fertility in 1989 was 2.4 children (compared to 4.1 for the nation). There is no doubt that Goa's fertility and mortality declines have been the most remarkable in India--more rapid than in Kerala, but far less publicized.

Family Planning Practice and Lessons

According to official family planning statistics, in March 1988 only 27.6 percent of Goa's eligible couples used any modern method of contraception, but according to the 1988-89 ORG Baroda survey, the percentage of eligible couples in Goa who did so was 43 and the percentage using any method including traditional ones was 61. According to the ORG survey, 14.8 percent of eligible rural couples and 18.5 percent of urban couples were practicing natural family planning methods in 1988. There appears to be widespread practice of rhythm, abstinence, and coitus interruptus, all methods widely supported by the Catholic church. Another 15 percent of couples use modern contraception obtained through nongovernmental sources including pharmacies, private physicians, nursing homes, and so on not included in official service statistics.

**Table 7.5 Trends in Crude Birth and Death Rates:
Goa, Daman, Diu, India, 1961-90**

Year	Goa, Daman, Diu		India	
	CBR	CDR	CBR	CDR
1961 ^a	32.0	13.4	41.5	20.9
1966 ^a	23.8	11.2	41.2	19.0
1971 ^a	28.8	9.2	39.2	17.0
1976 ^a	25.9	8.0	37.2	15.0
1981 ^b	18.3	7.0	33.9	12.5
1986 ^c	21.2	7.7	32.6	11.1
1987 ^c	18.9	7.5	32.2	10.9
1988 ^c	17.7	7.9	31.5	11.0
1989 ^c	15.5	7.8	30.5	10.2
1990 ^c	15.1	7.6	29.9	9.6

Sources: ^aFor Goa, based on vital registration data until 1976, Sample Registration System (SRS) thereafter; ^bfor India, census-based estimates until 1976, SRS thereafter; ^cfrom SRS

Thus, it is evident that Goa's fertility decline has largely been achieved by three major factors:

1. an increase in brides' age
2. a good proportion of women remaining single throughout their reproductive span
3. a large proportion of women using natural methods of contraception on their own initiative (18 percent), another 15 percent using modern methods from nongovernmental sources, and another 28 percent using modern methods secured from governmental sources (61 percent total).

In summary, the fertility of Goanese women was lower than in the rest of India, even before Goa's integration with the Indian union. The decline accelerated after 1976 with the expansion of official service facilities under the national family planning program. Goa's 1989 TFR of 2.4 was very near the replacement level of fertility. The motivation for controlling family size in Goa started long before 1961, with exposure of the Goanese to Western culture and civilization under Portuguese rule. The Catholic religion promoted the adoption of natural methods and control of fertility among Christians, followed by Hindus adopting modern methods. The practice became widespread with the initiation of the national program of family planning in 1961. Thus, the roots of demographic transition can be traced to Goa's socioeconomic and cultural conditions with the official family planning program playing a legitimizing and supportive role rather than the primary role of motivating couples toward small family norms and making them adopt modern contraception. Goanese fertility decline typifies the powerful role of social, economic, and cultural factors playing a dominant role in initiating fertility decline. Women's status in Goa was high even before any official program was introduced and infant mortality was lowered. The social and health conditions for adopting modern family planning methods were already ripe when the official program was introduced to accelerate contraceptive practice and fertility decline.

THE CASE STUDY OF KERALA

Background

Kerala is located on the Western coast of the southern peninsula of the Indian subcontinent. It is a narrow strip of land with the Arabian Sea on the west, the Western Ghats mountains to the east, the Indian Ocean to the south, and the states of Tamil Nadu and Karnataka bordering on the east and north. Kerala was constituted in 1956 on recommendations of the State Reorganization Commission on the basis of the language, Malayalam, spoken by the majority of people, through merger of three separate administrative units: Travancore in the south, Cochin in the middle (two independent princely states), and the Malabar Region of Madras Province of British India. Kerala is blessed with rich alluvial soil and abundant

rainfall, washed by 40 or more rivers flowing from the Western Ghats into the Arabian Sea. The state is noted for its scenic beauty--rich foliage, coconut and palm trees, and plantations growing coffee, tea, rubber, and spices--and for the precious few of the rain forests preserved in the subcontinent.

Kerala, in its present boundaries, has always had the highest population density in India. The 1991 census enumerated Kerala's population as 29.10 million with a density of 748 persons per square km, the highest for any state in the country (except the union territories which are large urban areas).

Because of its long coast on the Arabian Sea, it was the meeting ground of various civilizations from the West. One of the apostles of Jesus Christ arrived in Kerala, followed by many missionaries, and preached Christianity in this population as early as the first and second centuries A.D. Kerala can boast of some of the oldest Christian sects in the world such as Latin Christians and the Syrian Orthodox Church. Islam came to Kerala through traders from Arabia long before Muslim invaders came to rule the subcontinent in the 12th century. The Portuguese and Dutch visited this state in the 15th and 16th centuries long before the British came to rule India.

Kerala's cultural history, especially in the southern part of Travancore, was that of a princely state that enjoyed considerable autonomy under British rule. Kerala was reigned by a succession of enlightened kings who were considered benevolent and scholarly; they encouraged the fine arts, literacy, and above all, promoted gender equality, sanitation, and public health. The high status of Keralan women can be traced historically to Marumakkathayam--a matriarchal form of property inheritance from mothers to daughters in a sizable segment of the society. Similarly, the continuous exposure to Western civilization because of missionaries and traders from the West, mainly motivated by the popularity of Kerala's spices, gave the state a historical advantage of over a century in education, infrastructure (especially a network of roads and canals to facilitate the movement of coffee, tea, rubber, and spices to the coast), and social values of sanitation and personal hygiene.

The demographic transition in Kerala has been rather unusual among developing countries. Until 1971 the annual rate of population growth of Kerala was higher, consistently and substantially, than the rest of India (Tables 7.6 & 7.7). Even during the first decade of the century, Kerala's population grew almost twice as fast per year as did the nation. Not until 1968 did Kerala fall behind India. Kerala's demographic transition of consistent declines in mortality and fertility seems to have begun at least three decades prior to the rest of the country.

Even as early as 1931-40, the death rate in Kerala was significantly lower than in India (Table 7.8). There has been a steady decline in mortality since 1931 and from 1966 to 1989,

Table 7.6 Crude Birth Rates over Three Decades: Goa, Kerala, and Portugal, 1961-89

Region	1961-70	1971-80	1985-87	1989
Goa, Daman & Diu	22.3 ^a	27.0 ^a	19.2 ^c	15.5
Kerala	37.5 ^b	28.0 ^c	22.5 ^c	19.8
India	41.2 ^b	34.4 ^c	32.6 ^c	30.5
Portugal	20.1 ^d	18.5 ^d	14.0 ^d	11.9 ^d

Source: ^aVital Statistics of India, 1961-1980; ^bSinha, 1987; ^cRegistrar General of India, Sample Registration System, 1976-77; ^dUnited Nations, 1979, 1989.

Table 7.7 Population Growth Trends: Kerala and India, 1901-91

Year	Population in thousands	Kerala		India	
		Growth Rate	Sex Ratio	Growth Rate	Sex Ratio
1901	6396	NA	1004	NA	972
1911	7148	1.09	1008	0.56	964
1921	7802	0.90	1011	0.03	955
1931	9507	1.98	1022	1.04	950
1941	11,032	1.50	1027	1.33	945
1951	13,549	2.08	1028	1.25	946
1961	16,904	2.24	1022	1.96	941
1971	21,347	2.26	1016	2.20	930
1981	24,454	1.77	1032	2.22	935
1991	29,099	1.31	1036	2.11	927

Notes: Annual growth rate = annual growth rate (exponential) since previous date; NA = not available

Source: India, Registrar General, 1991b

there was more than a 50 percent decline in the crude death rate. Up to 1966 there had been very little difference between Kerala's crude birth rate and India's: four births fewer per thousand in Kerala than in the nation. On the other hand, Kerala's brides have always been older than in the rest of the country, for example, 4.6 years older than Indian brides in 1941. If brides in Kerala were always older than Indian brides, then their marital fertility should have been higher than in India for Kerala's crude birth rates to be almost identical to the rest of the country. However, in 1966 marital fertility began to decline. Kerala's total fertility rate dropped by 55 percent in 17 years from 4.6 in 1972 to 2.0 in 1989--the maximum fertility reduction achieved by any state in India. During that period, infant mortality in Kerala also fell sharply as it did in the nation. Female life expectancy in the state from 1986 to 1991 has been estimated at 71.1 years. In life expectancy at birth, infant mortality, and fertility, the present conditions in Kerala are comparable with those in Sri Lanka, Thailand, Korea, and China and also with some developed countries.

On the other hand, Kerala continues to be economically backward, even for India, with a per capita income estimated at Rs. 1447 in 1989 (US \$120 at 1980-81 prices), compared to the Indian average of Rs. 2234 or US \$190. Kerala is also one of the less urbanized Indian states with only 26 percent of its population living in urban areas. How did such an economically backward and rural state as Kerala achieve such a high life expectancy (about 71 years), low infant mortality rate (17 in 1990), and low fertility rate (TFR of 2)?

Kerala's achievement in demographic transition is in essence much more significant than that in many developing countries such as Thailand, Korea, Singapore, and Sri Lanka. These nations have not only progressed economically more rapidly than Kerala during their demographic transitions, but as independent nations pursuing their own economic and demographic goals, they also had well laid out, independent population policies and programs. Kerala, on the other hand, as an integral part of the Indian union, followed the population policy and family planning goals laid out by the central government (although formally agreed to by its state government) and also adhered to national staffing patterns and program strategies. The same policies and program strategies that were successful in Kerala were not so effective in many other Indian states, especially the large Hindi-speaking states of the north.

How did the same policies and program strategies succeed so dramatically in Kerala, while they often did not elsewhere? Various studies carried out by demographers and social scientists in Kerala and outside have led to a number of alternative hypotheses about plausible factors that have contributed to Kerala's rapid demographic transition.

Table 7.8 Trends in Vital Rates and Age at Marriage: Kerala and India, 1931-89

Period	Rates						Singulate* Mean Age at Marriage	
	Crude Births		Crude Deaths		Infant Mortality		Kerala	India
	Kerala	India	Kerala	India	Kerala	India		
1931-40	40.0	45.0	25.0	31.2	NA	176	19.3	14.7
1941-50	40.0	40.0	20.0	27.4	NA	168	19.9	15.6
1951-60	39.0	42.0	16.1	22.8	120	148	19.8	15.1
1961-70	37.0	41.0	13.5	19.0	92	139	-	-
1966	36.0	40.0	13.0	19.0	74	135	-	-
1971	32.0	37.0	9.2	14.9	61	129	21.0	17.2
1976	26.0	34.0	8.3	15.0	56	129	-	-
1981	26.0	34.0	6.9	12.5	37	110	21.9	18.3
1986	22.5	32.6	6.1	11.1	27	96	-	-
1987	21.7	32.2	6.1	10.9	28	95	-	-
1988	20.3	31.5	6.4	11.0	28	94	-	-
1989	19.8	30.5	5.9	10.2	22	91	-	-

* Computed by Hajnals method from census data

Source: Zachariah, 1984

Social Justice and Equity Hypothesis

Based on a careful analysis of various factors that have contributed to the rapid demographic transition in Kerala, Ratcliffe (1978) argues that the most important factor was structural change in the political economy since the early 1950s: land reform, minimum wages in agriculture and the organized sectors, and large public investments by the state government in primary and secondary education. The egalitarianism brought about by these policies by successive democratically elected Marxist governments for almost two decades has been reported as instrumental in bringing about rapid fertility and mortality declines. Social and economic equity seems to have been the most distinguishing feature of Kerala. Whether such an equity in a developing country is brought out by a Marxist government or other forms of social democratic governments does not seem to matter. To quote Ratcliffe,

The implications of the Kerala experience for other Third World populations, as well as for the western population control movement, seem clear and straightforward. If the reduction of population growth rates is indeed a priority, and if social development is more than merely an espoused goal of development strategies, then structural changes in the political economy are essential strategies. And, as the Kerala example points out, such changes must be based upon equity considerations rather than aggregate economic growth considerations. The task that faces those interested in reducing fertility levels is not the manipulation of human behavior to suit the needs of outmoded and oppressive institutional structures; instead, it is to change those institutional structures to suit contemporary human needs. It is only through this approach that contraceptive delivery systems can be placed in their proper perspective: as programs designed not to control aggregate fertility but to assist individual couples in achieving their desired family size. (Ratcliffe, 1978 p. 144)

Moni Nag (1982), comparing conditions in West Bengal and Kerala, both under Marxist rule for over two decades, finds that the mortality and fertility declines observed in Kerala are not apparent in West Bengal. He attributes this difference largely to differentials in female education, suggesting that social justice without female literacy may not be that effective in producing demographic change.

Political Capacity or Degree of Government Hypothesis

Political capacity is defined by Organski et al. (1984) as the ability of government to penetrate society and extract resources. A government that has a higher political capacity can be expected to be more effective in the implementation of social development policies, including family planning, health, and educational programs. It is a measure of the ability of government to penetrate society to secure compliance with its policies and extract and distribute resources. In a major study undertaken by Organski and his collaborators in 1980, it was found that the tax structure in a country is the best measure of the capacity of the

political system (Organski et al. 1984). They found that the demographic transition in developing countries is highly correlated with the increases in the taxes imposed by the government. The logic behind this relationship between the higher tax rate and reduction in mortality and fertility rates is because of the higher resources available to the government for implementation of its welfare policies, including public health and family planning programs. They demonstrated that broad trends in the crude death rates and birth rates in developed and developing countries were closely associated with increases in the tax burden of the people. It was concluded on the basis of empirical evidence that countries which have the ability to impose higher taxes on the people and collect them will also have a higher capacity to implement welfare and development programs.

Rouyer (1987) empirically demonstrated the key role that political capacity has played in explaining the differentials in fertility among the fifteen large states of India. Operationally, he defined political capacity as the ratio of per capita tax revenue to the government to the per capita GDP. He used this ratio to GDP in order to minimize the effect of macro-economic conditions on tax effort. Using a path model with six variables: crude birth rate (dependent variable), family planning program effort, mean female age at marriage, physical quality of life index (PQLI), income per capita, and political capacity, he showed that there is a strong significant effect of political capacity measure on fertility decline. However, the effect was indirect through both the PQLI and family planning effort. He found that among all the states in India, Kerala, in spite of its low per capita GDP, had the maximum tax/GDP ratio and highest percentage of government expenditures on welfare. He concluded that under conditions of economic backwardness, as they prevail in India, it is politics and not economics that are the determinants of fertility patterns.

Socioeconomic Determinants

Many authors (Krishnan, 1986; Nair, 1974; Zachariah, 1984) argue that the socioeconomic changes that preceded Kerala's demographic transition altered the cost-benefit ratio of children to parents and the society. They were primarily developments in public health and universal education over a long period of time. The increased number of surviving children, together with parents' perceived higher cost of educating their children, raised the cost of child rearing in Kerala and paved the way for successful practice of family planning methods. The family planning program, by developing a network of service facilities and making them easily available and accessible, met people's rising needs in this direction.

The cutting edge of social change leading to demographic transition seems to be female literacy. With the rise in female literacy and education of girls, age at marriage increased,

the health care of children within the family improved, child mortality declined, and family planning acceptance increased, paving the way for fertility decline.

The rapid increase in female literacy in Kerala after independence was unique in India and historically could be traced to the higher status of women already existing among many communities (related to Marumakkathayam), and Christian missionaries' emphasis on modern education for over three centuries. Despite the emphasis on literacy in Kerala and the adjacent state of Tamil Nadu, while Kerala succeeded remarkably in rapidly increasing female literacy, Tamil Nadu could not achieve such an improvement because of cultural differences in the status of women between the two states. Thus, a combination of cultural, political, social, and family planning program factors seems to have played a synergistic role in promoting contraceptive practice and declining fertility in Kerala. To quote Zachariah (1984, p. 58):

If the official program has succeeded in reducing fertility very significantly in Kerala, as we have been able to show that it has, why has it not been as successful in many other States? What is different about Kerala is not greater family planning inputs, at least not as measured by budgetary allotments. The success in Kerala is more likely due to a more efficient delivery of services and a higher spin-off effect--that is, a higher interaction between family planning services and socioeconomic conditions. The same level of family planning services as in other States has been more effective in Kerala because of the different socioeconomic conditions, especially lower mortality and higher female literacy.

The Malthusian Hypothesis

Kerala had, since the beginning of the century, a very high population density compared to the rest of the country. The number of persons per sq. km in 1991 was 748, the second highest after West Bengal in India; until 1981, Kerala had the highest density. Kerala meets its food requirements by purchasing grains from other states since its agricultural land is mainly used for cultivating spices, coconuts, tea, coffee, and rubber.

Kerala has few industries and consequently few opportunities for employment in the organized sector. For decades Kerala has exported manpower to other parts of the country. A large proportion of nurses, midwives, teachers, typists, and other skilled and semiskilled persons working in other parts of the country, including the north Indian states of Rajasthan and Uttar Pradesh, are migrants from Kerala. When young men and women have to leave the state in search of jobs, age at marriage rises, periods of spousal separation increase, family planning practices become accepted, and fertility declines.

Kerala's per capita income has been quite low over the decades, although there is some homogeneity in the poverty. Increased age at marriage and use of contraception can be considered Malthusian checks operating on a population which has multiplied beyond its

means of subsistence.⁹ There seems no alternative than for Kerala to adopt these checks if famine and epidemics are to be avoided. Again, the exposure of large segments of Kerala's population, especially in the coastal areas, to the Western values and behavior of the missionaries and traders who came in large numbers after the 18th century helped promote the concepts of late marriage for women, nonmarriage, and use of family planning methods. Kerala's Catholic population has contributed a substantial number of nuns who work in Kerala, other states, and also in many other countries. Thus, Kerala's rapid fertility decline can be considered a Malthusian reaction of a population subjected to high density, low income, poor employment chances, and lack of subsistence in its own territory.

The Four Hypotheses

Each of the four hypotheses discussed above for explaining fertility decline in Kerala has its professional and theoretical advocates who have used the same data sets for supporting their particular point of view. It is extremely difficult, if not impossible, to arrive at unequivocal conclusions on the precise set of forces that have contributed to fertility decline in Kerala. Such conclusions can be drawn only from experimental designs, longitudinal studies with control groups, and a theoretical understanding of all the factors that influence fertility. In the absence of the above, findings from correlations and regression analysis of cross-sectional data and an understanding of the dynamics of change in Kerala's population must suffice. In all the hypotheses, three factors are unique in Kerala:

1. Higher status for women leads to more education for them and resulting in higher age at marriage coupled with better care of infants and children by mothers leading to lower infant and child mortality;
2. Better organized family planning programs that are more accessible and offer higher quality of services;
3. The egalitarian outlook for the society as a whole, leading to higher taxation and a higher percentage of state government expenditure on education and health that helped to spread the small family norm across all sections of the society rapidly.

Kerala typifies a balanced "top-down" and "bottom-up" force operating for fertility decline. The top-down part is the political capacity and organization of the national family planning program in the state, and the bottom-up forces are the demand for such services from the population, especially from the women because of better education, higher status, and other factors.

⁹ Adopted in Ireland as a means of curtailing growth rate, during the potato famine of the nineteenth century.

THE CASE STUDY OF TAMIL NADU

Background

Tamil Nadu is located on the eastern coast of the south Indian peninsula. Until independence in 1947, Madras Province was one of the largest in British India and included the present state of Tamil Nadu, the Malabar region of Kerala, a substantial portion of the adjoining states of Andhra Pradesh, Karnataka, and Orissa. Tamil Nadu was formed as a separate state called Madras in its present boundaries in 1956 on recommendation of the commission charged with reconstituting India's states on linguistic bases. In 1974 the name was changed to Tamil Nadu, meaning the land of Tamil-speaking people. Madras Province with its state capital at Madras City was considered one of the most efficient, progressive, and well administered states in British India. With the 1956 reorganization of the states, Madras City lost its importance as the prime city of the south in India.

According to the 1991 census, Tamil Nadu had a population of 55.86 million and a population density of 429 persons per sq. km. In population size, Tamil Nadu ranks seventh, and in density, eighth in the country.

The state has a rich cultural heritage spanning over two thousand years and the language of Tamil is one of the oldest in the world, older even than Sanskrit. Sanskrit is considered to have been developed mostly by the Aryans in the north and although considered a major cultural heritage of India, many Tamilians believe it blocked the further development of their unique language and culture, Dravidian. The Tamilians are proud of their rich heritage of language and culture and since the beginning of this century there have been movements that attempted to revive the past glory of the Dravidian culture and establish its separate identity from north Indian Aryan culture--at times Tamilians have even sought political independence as a separate country.

The Self-Respect Movement in Tamil Nadu

In the 1920s, the self-respect movement was started by the Justice Party of India whose main objective was to free the Dravidians from the oppressive cultural and economic influences of the Aryans. This movement was mainly directed against the evils of the caste structure and targeted against Brahmins, who were considered responsible for maintaining and perpetrating the caste system, stratifying the society, and keeping the people of Tamil Nadu divided. The Justice Party over the decades has transformed itself and bifurcated into various parties such as Dravida Munnetra Kazhagam (Dravidians progressive group), ADMK (Anna Dravida Munnetra Kazhagam, named in honor of Mr. Anna Dorai, a charismatic leader), and AIADMK (All India Anna Dravida Munnetra Kazhagam)--currently

in power. During the past 25 years, one or the other of these regional parties has been in power in Tamil Nadu. The main goals of the regional parties were promoting the Tamil language and Dravidian culture, eradicating the caste system afflicting the Hindu society, and developing the state economically.

The Justice Party and its offshoots had a number of charismatic leaders such as E. V. Ramasamy Naicker and Anna Dorai and have instituted overt and covert social changes in the Tamil society. One of them is termed self-respect marriage which carries a threefold significance: (1) replacing the traditional purohit or Brahmin priest who usually conducts marriage rituals; (2) promoting intercaste marriages; and (3) promoting equality of the sexes. In many intercaste marriages, conducted unofficially since 1925 and officially since 1967, Dravidian Party leaders presided over the event, spoke of the evils of the caste system, emphasized equality of the sexes--the male and the female child, and, most importantly for family planning advocates, spoke of the advantages of the small family. Self-respect marriages were legalized in 1967 by the DMK (Dravida Munnetra Kazhagam) government.

The political advantage emanating from self-respect marriages, seems to be the perpetration of the small family norm in Tamil society even before independence. For example, in her biography of E. V. Ramaswamy Naicker, popularly called Periyar, Anita Diehl (1977) discusses his views on women's rights. According to Hindu tradition, especially among higher castes, widows were seldom allowed to remarry. In his early opposition to caste regulations, Periyar advocated women's rights when he defied his orthodox kinsmen by encouraging his young niece to remarry after her husband had died early in marriage. In 1926 Periyar published in *Kudi Arasu*, a Tamil newspaper, 1921 census statistics showing that there were 1189 widows in India below the age of five. Self-respect conferences in 1929-30 emphasized women's rights to divorce and property. Periyar believed the marriage age for girls should be 16, as it was later set out in the Sarda Act, and that widows should be helped to remarry. Periyar's propaganda for family planning has a place in this context.

Population Growth and Fertility Trends

Population growth rates in Tamil Nadu have been lower than the all-India average (unlike in Kerala) since 1921, except during 1941-51. During the period of 1901-51 the average annual growth rate of Tamil Nadu was 0.88% compared to 1.5% in Kerala and only marginally higher than the national average of 0.83%. Since 1951 the growth rate of Tamil Nadu has been significantly lower than the rest of the country. This implies that fertility was lower than the Indian average since mortality in Tamil Nadu has always been lower than the national average (see Table 7.9). Fertility decline in Tamil Nadu since 1970 has been very dramatic. The crude birth rate fell by 30 percent from 33.7 in 1972 to 23.1 in 1989; total

Table 7.9 Population and Fertility Trends: Tamil Nadu, 1921-91

Year	Population (millions)	Sex Ratio	Intercensal Rates	
			Annual Growth (%)	Crude Births
1921	21.6	1029		
1931	23.4	1027	0.80	47.1
1941	26.3	1012	1.17	42.8
1951	30.1	1007	1.35	41.1
1961	33.7	992	1.13	35.8
1971	41.1	978	1.99	34.9
1981	48.4	977	1.63	30.4*
1991	55.9	974	1.39	24.1*

*SRS estimates for 1975-77 and 1985-87 respectively

Source: India, Registrar General, 1991b

fertility declined more sharply--by 42 percent from 4.3 in 1972 to 2.5 in 1989. Total marital fertility has declined 20 percent from 5.6 in 1972 to 4.5 in 1989.

The technique of standardization, adopted to decompose changes in the crude birth rate because of various demographic factors, indicated that 83 percent of the decline in CBR from 1972 to 1989 can be attributed to declines in marital fertility of the population (see Table 6.4). In the context of rising trends in natural fertility because of modernization, any reduction in observed marital fertility rates underestimates the fertility impact of contraception.

The age of Tamil Nadu brides has significantly increased over the years. The singulate mean age of marriage (SMAM) for women estimated from census data was 19.6 years in 1971 and 20.2 in 1981 and is currently estimated at around 21 years. For men the SMAM was estimated at 25.9 years in 1971 and 26.0 in 1981. Thus, traditionally high age differences between husbands and wives in Tamil Nadu have narrowed in recent decades because of women's increased literacy and educational attainment. Among India's larger states, the maximum singulate age at marriage in 1981 for women was 21.8 in Kerala, 21.1 in Punjab, with Tamil Nadu third.

Tamil Nadu has also experienced in the past two decades substantial declines in general mortality as well as mortality of infants and children. The crude death rate declined by 6.4 from 1970-72 to 1989. Infant mortality dropped about 50 percent from 1959 to 1989. However, the 1989 IMR of 68 is still considered high for the realization of such a low TFR of 2.5. The fertility decline in Tamil Nadu with a population less literate than that of Kerala (only 51.3 percent of females literate at ages 7 and above in Tamil Nadu's 1991 census compared to 86.2 percent in Kerala) is also worth noting. While rural-urban mortality differentials still persist in Tamil Nadu (rural IMR almost double the urban rate), fertility differentials have practically disappeared (Table 7.10).

Kerala had a higher 1971 female literacy rate than Tamil Nadu in 1991, with a TFR of 4.0 in 1971, compared to Tamil Nadu's 1991 TFR of 2.5. A comparative demographic and socioeconomic profile of Goa, Kerala, Maharashtra, Tamil Nadu, and Uttar Pradesh appears in Table 7.11. From the contextual conditions of female literacy, status of women, and general and infant mortality levels currently prevailing in Tamil Nadu, the achievement of such a low TFR of 2.5 is worth investigating. Part of the reason can be traced to the strong political will for a small family as expressed by regional party leaders (Dravida Munnetra Kazhagam and its offshoots). The other major reason for the success of family planning and fertility decline in Tamil Nadu is the effectiveness and efficiency of its official bureaucracy.

Table 7.10 Recent Trends in Selected Fertility and Mortality Indicators: Tamil Nadu, 1970-89

Years	Crude Birth Rate			Crude Death Rate			Infant Mortality Rate		
	Rural	Urban	All	Rural	Urban	All	Rural	Urban	All
1970-72	33.6	25.8	31.3	17.5	9.2	15.0	131	84	120
1973-75	32.1	25.1	30.0	16.7	8.7	14.3	123	68	109
1976-78	30.9	27.0	29.8	15.4	9.6	13.7	118	74	106
1979-81	29.6	25.2	28.3	13.1	8.4	11.7	117	61	95
1982-84	28.9	26.0	27.9	12.9	8.2	11.3	96	54	83
1985-87	24.5	23.5	24.1	10.9	7.2	9.6	93	54	80
1988	23.4	21.4	22.7	10.3	7.3	9.3	84	51	71
1989	23.5	22.2	23.1	9.7	6.6	8.6	80	43	68

Source: Sample Registration System

Table 7.11 Comparative Demographic and Socioeconomic Profiles: Goa, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh, and India, 1981-90

Characteristics	Goa	Kerala	Maharashtra	Tamil Nadu	Uttar Pradesh	India
Population in Millions, March 1, 1991 ^a	1.17	29.10	78.94	55.86	139.11	846.30*
Population Density in Km ²	(316)	(748)	(256)	(429)	(473)	(257)
Bride's Age, 1981	22.80	21.90	18.80	28.20	17.80	18.30
e° (F), 1986-91	67.50	71.10	62.90	60.80	49.60	59.10
Crude Death Rate, 1989	7.80	5.90	7.90	8.60	12.60	10.20
Decennial Population Growth (%), 1981-91	16.08	14.32	25.73	15.39	25.48	23.79**
Literacy Rate, Females Aged 7 and More, 1991	67.09	86.17	52.32	51.33	25.31	39.29**
Per Capita Net Gross Domestic Product at Constant Price (Rs.), 1987-88	3545.00	1416.00	2816.00	1811.00	1452.00	1910.0 ^b
% Population below Poverty Line, 1987-88 ^c	16.00	16.90	29.10	32.80	33.00	29.20
Road Length per 100,000 Population (km), 1983	350.00	413.00	292.00	301.00	130.00	246.00
% Women Employed to Total Employed in Organized Sector, 1989	28.00	35.00	12.80	20.60	7.60	12.00
Effective Couple Protection Rate, March 31, 1990	33.20	54.40	54.40	57.10	33.30	43.30
Average No. Living Children at IUD Insertion, 1988-89	1.60	2.00	1.80	1.90	2.70	2.30
Average No. Living Children at Tubectomy, 1988-89	3.40	3.00	3.30	2.90	3.80	3.30
No. Tubectomies per Bed in Postpartum Centers, 1989-90	5.00	125.00	65.00	115.00	62.00	69.00
Crude Birth Rate, 1989	15.50	19.80	28.30	23.10	37.00	30.50
Total Fertility Rate, 1989	2.40	2.20	3.50	2.50	5.50	4.10
Infant Mortality Rate, 1989	28.00	22.00	59.00	68.00	118.00	95.00

^a Final Population Totals from India, Registrar General, 1991 (Paper 2 of 1992), ^b Net national product

^c At Rs. 49 per capita per month at 1973-74 prices, * Includes estimated population of Jammu and Kashmir

** Excludes the population of Assam, Jammu and Kashmir

Source: Census of India and Sample Registration System

Political Will and Bureaucracy

Social and political will. Tamil Nadu has had a unique social awareness movement since the 1920s created by the great social reformer Periyar (E. V. Ramaswamy Naicker). His thoughts and ideas, while shocking to a caste-dominated society, clearly set in motion strong social currents. In his acerbic style, he chastised the concept of a woman being just a "childbearing machine." Periyar enjoyed mass support and hence his pronouncements on the status of women, caste, marriage, contraception, birth control, and social change created an atmosphere congenial to acceptance of the small family norm. Long before the government had a program for family planning, Periyar emphasized the need to liberate women from frequent delivery by the use of contraception, the desirability of the two-child norm in every marriage, and not allowing marriage before a woman is 22, so that three to four births can be averted. All these views from half a century ago promoting contraception had to contend with strong social taboos. With the same party or its offshoots being in power at the state level since 1966, the concept of small family norm has defused through all segments of Tamil society.

Bureaucratic efficiency. For almost three decades, Tamil Nadu had a successful record in implementing a fertility regulation program. To achieve this, Tamil Nadu had the advantage of strong social and political commitment and a moderately high level of bureaucratic efficiency in implementing the program. In the early 1970s when the plank of the program was vasectomy, Tamil Nadu was a pioneer in providing special follow-up care for the acceptors after the operation. It was also one of the states in which the "camp approach" evolved and was institutionalized. In the early 1980s, based on a national reiteration of the need for effective fertility regulation programs, the state took the lead in building a comprehensive program, covering not only family planning, but a wide variety of maternal and child care services. The mobilization in Tamil Nadu of a gigantic nutrition program with World Bank and Danish government assistance (DANIDA) for providing nearly nine million school children a daily hot midday meal on school premises, coupled with the employment generated for this program (over 200 thousand women in villages and towns to serve these lunches) has also contributed to the success of the family planning program. As contrasted to India where the birth rate has hovered around 33 for almost a decade (1977-87), the Tamil Nadu birth rate fell from about 29 to 24.8 in the same period. Tamil Nadu received National Awards in Family Planning for three years in succession (1984-85, 1985-86, and 1986-87). Tamil Nadu achieved a much lower level of fertility at a relatively lower level of couple protection by a greater emphasis on postpartum programs.

In most states, health and family planning departments dealt with family planning activities on a vertical basis, without intersectoral linkages with other departments. But in Tamil Nadu, achieving the contraceptive target was considered the district administrator's special function and responsibility. The advantage of this approach was that he can supplement the strength of the health department with the services and manpower of other departments such as rural development, municipal administration, and even regulatory departments.

Tamil Nadu also benefited from the experience of several successful experimental action research projects. Particularly useful were those conducted by the Gandhigram Institute of Rural Health and Family Welfare, since 1959, which demonstrated how influential and interested community leaders can be involved in family planning and maternal and child health (MCH) programs in rural areas to motivate couples to accept a small family norm, promote use of modern methods of contraception, and use of MCH services. This field experiment stimulated the involvement of thousands of popular, local leaders in the program. The program has really become a people's program.

Another successful experiment in harnessing the entire official energies of a district in achieving a contraceptive target was conducted in Tanjore in 1971-72 (Antony et al., 1989). The district administration felt that to raise annual levels of contraceptive acceptance to a point where it would have significant demographic effect, the program should contain strong components of teaching, (reasons for having a small family), extension (instruction about contraceptive services), and "after care" services with special attention to those undergoing vasectomy. To step up the level of communication, the services of the Rural Development and Agricultural Departments were used to organize functions, sponsor group discussions, prepare radio talks and newspaper columns, and even stage gala processions in which beautifully decorated temple elephants were used to promote the program. In all these activities, political leaders of all parties freely participated. To ensure that all understood the implications of contraception, special classes were held for a variety of field employees, not merely health workers. These workers in turn passed on the message to possible acceptors.

To ensure proper services when vasectomy facilities were still being built in health centers, special camps were set up simultaneously in schools during the December vacations to provide fairly good facilities for vasectomies with trained manpower from hospitals and a week's stay for the acceptor after the operation, so that essential after care services were ensured. Concentrated publicity, effective extension services, and postoperative services paid dividends in terms of vasectomy acceptance by a huge number. In one camp in 1971, in just 40 days over 20,000 men underwent sterilization without a single major complication--versus barely 5,000 in the previous year for the entire district. This camp approach with modifications to suit local conditions was then tried all over Tamil Nadu, with considerable

success in maintaining vasectomy figures at a fairly high level until 1977. After 1977, in Tamil Nadu as in the rest of India, vasectomy lost its popularity but was quickly replaced by tubectomy and laparoscopic sterilizations for women.

Since 1982-83, the program, measured in terms of acceptance of temporary contraceptive methods, has been steadily improving, with the equivalent sterilization figure growing from about 300,000 in 1982-83 to over 700,000 in 1987-88. One criticism leveled against the Tamil Nadu program in its earlier stages was that it leaned heavily on sterilization, with only marginal reliance on temporary methods. The government argued that this was because of a lack of adequate female staff to insert the IUD or discuss the pill with women. Intensive training in 1984-85 and 1985-86 for all paramedical staff members focused on temporary methods and in particular, IUD insertion. In a five-year period (1982-87), IUD acceptance soared from about 55,000 to around 500,000 and pill acceptance from 11,000 equivalent users to about 150,000 in 1987-88. Moreover, the emphasis now is on teaching acceptance of spacing techniques as soon as the first child is born in the interest of maternal and child health. This is likely to increase the spacing between births, and consequently reduce the birth rate. The program is now broad based.

Effective communication strategies. From the early 70s, considerable emphasis went to communication programs in the state. Banners and posters sprouted all over Tamil Nadu. Processions with attendance in the tens of thousands paraded through district headquarter towns proclaiming support for the planned family. An important step in communication was coining and using audience specific-messages. For instance, the farming community is informed that "One Family, One Heir" will prevent further bifurcation of the already fragmented land holdings in the next generation. Similarly, slum dwellers are shown mini-films of the quarrels that can ensue if their tiny hut must house several children. Employees are educated about the importance of stopping child bearing when the father is 33, so that when he retires, usually at 58, his last child would be fairly well settled--already educated and married. These messages have been made into one- to two-minute films used for discussions in labor union meetings. To spread the message, every available medium is used, including the state helicopter bearing family planning symbols to distribute leaflets on slum areas. All public vehicles--buses, lorries, etc.--bear prominent messages on family planning and the well-known symbol, the inverted red triangle. The Chief Minister convenes meeting of the state legislators at which the main topic is developing new audience-specific messages.

Extension workers have had special training in contraception since the 1970s, using an illustrated book in Tamil containing dos and don'ts and a proforma questionnaire. These

newly trained extension staff members organized thousands of orientation training camps for the education of village leaders.

An important aid to the planned family program, although not specifically designed as such, began in the 1980s with the Chief Minister's Mid-Day Meal scheme, which covers the whole state. The program is based on the model schemes implemented in two districts of the state with funding from the World Bank and DANIDA. Under the plan, the government endeavored to banish malnutrition and simultaneously encourage children's continuation in schools, by providing every child in Tamil Nadu up to school-leaving age, a hot midday meal with rice and vegetable curry. The scheme presently caters to about nine million children at some 80,000 centers all over the state. While economic experts have railed at its huge cost (about 10 percent of the state's budget) and others have sneered at it as a political "give-away," the considered public opinion is that the scheme is very popular, particularly in rural areas. It has improved child health and survival, encouraged children to continue in school, has prompted a perceptible shift away from the compulsion to have an "extra child" as insurance against death and disease, and has altered the cost-benefit ratio of children to parents. Further, since about 200 thousand women, recruited in their own environment, operate the meal plan, the social status and sense of responsibility of a large group of women, particularly in the lowest socioeconomic level in the slums and rural areas, have been enhanced. These women serve as important communicators in the family planning program through daily contact with just that section of the population which is most difficult to reach with the message of the planned family.

Two other programs started this decade in Tamil Nadu, that have helped the family planning program. The Danish-assisted program DANIDA provides additional maternal and child health facilities, to about 15 percent of the population. The Tamil Nadu Integrated Nutrition Program receives World Bank assistance to improve child nutrition between the ages of six months to two years. There is also the work of voluntary organizations, often better organized than government units: the Family Planning Association of India, the Christian Medical Association, Andhra Mahila Sabha, Punjabi Association, Gandhigram Institute, and many others. The organized sectors of industry, plantations, railways, defense, and so on have their own very active programs not merely for their own employees but also covering entire residential localities. In the hill district of Niligiris, for instance, a plantation organization known as UPASI (United Planters Association of South India) supplements state efforts for over 300,000 people, mostly working on plantations.

Above all, the main influence on the program has come from political and administrative leaders at state headquarters. For several years, the State Health Minister has reviewed the program personally and periodically, even at the district level. State-level senior administrators have also played a considerable role by systematic monthly reviews, and even

more in coordinating the efforts of departments other than health to support this program. For instance, the family planning message now displayed on all public vehicles in Tamil Nadu has come about because of a directive from Tamil Nadu's Chief Secretary to transport authorities that a message be painted on the rear of every vehicle as part of the "fitness certificates clearance procedure." The regular monthly review by the Chief Secretary has impressed on all district heads the high priority this program enjoys. Within political and government circles, there is a strong movement for promoting a one-child family. Thus, the favorable political atmosphere and bureaucratic efficiency of the program which was able to combine the resources of many government departments, not only those of the Department of Health and Family Welfare as in other states, to the task of motivating and organizing family planning services seem to have paved the way for the successful demographic transition in Tamil Nadu.

SOME TENTATIVE LESSONS FROM THE CASE STUDIES

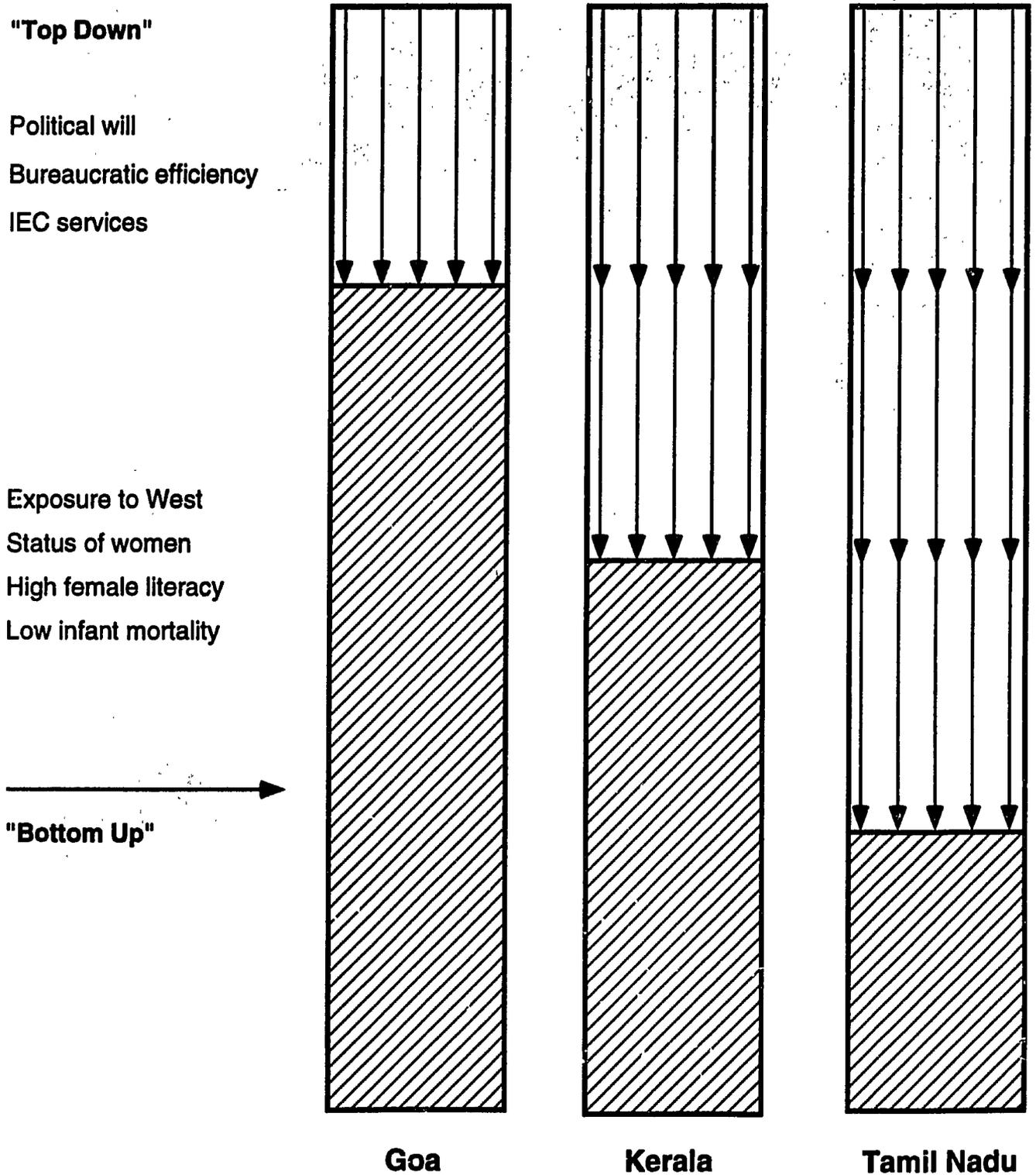
From the case studies of three states, Goa, Kerala, and Tamil Nadu, we can draw some lessons for successful fertility transition in populations of other states that have not been so successful. Goa's experience reveals that under social conditions wherein women's status in the society is high, mortality levels, especially of children are low, the population is fairly literate, and, most importantly, there is a long-standing exposure to a contraceptive-using population (in this case with the Portuguese as the rulers for over four centuries), then small family norms diffuse across cultural barriers, contraception (initially through natural methods) tends to be adopted, leading to acceptance of all modern methods of contraception, including sterilization, and finally, successful fertility transition. In this case, neither political will nor the governmental program of family planning played that crucial a role in fertility decline. The official program of family planning introduced in Goa after 1961 after its integration with the Indian union helped to legitimize what was basically accepted and practiced earlier by the Goanese population, to enlarge the service facilities and method options available, and to accelerate fertility decline. In the development parlance, this is essentially a bottom-up approach to fertility decline with very few top-down contributions to fertility change.

In Kerala although the status of women was quite good and literacy levels of men and women were fairly high even in the 1950s, it was found that fertility decline did not start until organized family planning programs were implemented with efficiency and imagination, from the early 1970s. There has been a positive, well-balanced interaction between social change and the family planning program in achieving low fertility in Kerala. A balance of top-down and bottom-up forces operates in the state toward its successful fertility transition.

In Tamil Nadu, the factors of political will and efficient bureaucracy seem to have played a crucial role in the fertility transition, overcoming the intrinsic cultural barriers imposed by low literacy levels, relatively higher mortality, low standards of living, and high heterogeneity of the population. The top-down forces seem to be more dominant than bottom-up forces in expediting the fertility decline in Tamil Nadu. The relative strength of the top-down and bottom-up forces as they operated in these three states are schematically represented in Figure 7.5.

The lesson that comes out strong and clear from these case studies is that even in situations where social and economic development in a population are not of a level that can motivate small family size and the use of modern methods of contraception as normal byproducts of modernization, it is possible to induce such attitudes and action by an effective combination of political will, bureaucratic efficiency, and a well-organized intersectoral family planning program. The optimal approach seems to be in the strategic balancing of the top-down and bottom-up forces required for successful fertility transition.

Figure 7.5
Differential Contributions of "Top Down" and "Bottom Up" Forces
in Achieving Fertility Transition in Goa, Kerala, and Tamil Nadu



CRITICAL ISSUES AND RECOMMENDATIONS

OVERVIEW OF THE PROBLEM

The United Nations estimated India's population at 879.5 million in mid-1992, on the basis of the 1991 Census results it is more likely to be 867 million. In any case, more than one-seventh of the human race lives in this country, the second largest in population size after to China. While China has been remarkably successful in bringing down its fertility levels and even the number of births per year, India has not been as successful and suffers by contrast. According to United Nations estimates, in 1990 India edged out China to become the country with the most births in a year: 26.07 million children compared to 24.58 million born in China, although China had 310 million more people than India. Obviously what happens to future fertility trends in India will not only influence its demographic trends but also those of the whole world.

The quality of life in India measured in terms of life expectancy, infant mortality, literacy--especially of females, per capita calorie consumption, and basic amenities available to the citizens has all improved substantially since 1947 when India attained political independence from Great Britain and began to implement developmental programs through successive five-year plans. However, compared to achievements in other developing countries such as China, Thailand, Korea, Mexico, and Sri Lanka, and the city states of Singapore and Hong Kong, progress in India falls very much short of expectations in economic development and social change.

For example, in India in 1990, 2.33 million children died before reaching their first birthday, whereas in China in the same year only 0.76 million infant deaths took place. The reductions in fertility and infant mortality that have occurred so rapidly in China, in comparison to India, account for the differentials in the number of infant deaths between the two countries. India's population continues to grow at about 2 percent per year, a rate that prevailed from 1950 to 1960. Birth and death rates have declined at almost the same pace during the past 30 years, making very little dent in the population growth rate. India can take legitimate pride in being the first country in the world to have a national population policy and having launched an official family planning program as early as 1951 as a part of its first five-year plan (1951-56). India has increased its financial and personnel inputs into the family planning program over the past 40 years in successive five-year plans. However, the birth rate seems to have declined only very slowly by about 12 points from 41.7 in 1956 to 29.4 in 1990--less than 30 percent in 34 years. Contrast this to what happened in China

which has reduced its fertility by about 60 percent in fewer than ten years. Similar reductions, though over a longer time span of 15 to 20 years, have been achieved by Korea, Taiwan, Hong Kong, Thailand, Mexico, and a number of Latin American countries. Over the past 25 years, East Asian countries as a whole, including China, have witnessed a fertility decline of about 60 percent, reaching a TFR of 2.4 in 1990. Similarly, in Latin America as a whole fertility has declined by 40 percent, reaching a TFR of 3.6 in 1990.

Over the past four decades, for its family planning program, India has spent 55.5 billion rupees or US \$4.62 billion (at the 1980-81 exchange rate). External assistance to the program was less than 10 percent. The current annual expenditure on the program is Rs. 7.5 billion per year (Rs. 50 per eligible couple). India is one developing country that is spending a sizeable proportion of its health budget on family planning activities, 13-14 percent per year. Sri Lanka, Taiwan, Thailand, Korea, and Singapore have spent a relatively smaller percentage of their health budgets (under 6 percent) on family planning but have achieved more significant results in increased contraceptive prevalence rates and reduced fertility. It is true that these countries receive substantially more financial and technical support for their family planning programs from foreign donors than India, but this factor alone cannot explain such large differentials. The 1990 contraceptive prevalence rate in India is estimated at 45% compared to about 75% in China, Korea, Taiwan, and Thailand and 66% in Sri Lanka. In this context it is worth investigating the factors that have hampered the impact of the family planning program on contraceptive use and fertility decline in India. This book is an attempt at such an understanding with a goal of accelerating the transition to replacement levels of fertility.

Analysis reveals an enormous diversity in the pace of fertility and mortality declines in India among the different states. The declines in fertility achieved in Goa, Kerala, and Tamil Nadu are comparable to the levels achieved in China, Sri Lanka, Korea, and Thailand. The slowest paces of change in family planning practice and fertility decline are observed in the large Hindi-speaking states of Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh which together constitute about 40 percent of India's population. A comparison of the nature of the changes that have taken place since independence in Goa, Kerala, and Tamil Nadu, with those that have occurred or failed to occur in the large northern Hindi-speaking states, helps identify the critical issues in the family planning program and fertility decline in India. These critical issues underlying the success of the program fall into two broad categories:

1. Problems or issues connected with the supply side of the program
2. Problems or issues relating to the generation of demand for the program.

Though there is a strong link between the extent and quality of family planning services delivered and the demand for them, as a first step, the issues can be considered separately to aid in organizing our recommendations.

On the supply side are four major areas of action that seem to have contributed to greater success of the program in India:

1. Political will for promoting small family norms and reducing fertility;
2. Strategic planning for shifting program emphasis from sterilization to spacing methods;
3. Bureaucratic efficiency;
4. Improved quality of services offered.

On the demand side two factors differentiate areas of more rapid decline in fertility from those with tardy declines:

1. Rising female literacy levels;
2. Rapid reductions in infant mortality levels.

SUPPLY SIDE ISSUES

Political Will

Political will can be defined as the ability of a few leaders to influence the attitudes, values, and behavior of many. The leaders, of different types and ideology, such as elected, charismatic, ascribed, hereditary, or religious have varying degrees of influence on their constituencies with regard to thought and behavior. The role of leaders is especially significant in developing countries where they have a dominant influence in shaping the views, attitudes, and behaviors of the people in many aspects of life. This is particularly relevant in illiterate populations which tend to listen to and follow the advice, suggestions, and examples of leaders. The crucial roles that interested and influential leaders can play in shaping the opinions on family size, use of modern methods of contraception, and fertility decline has been empirically demonstrated in a number of action-research projects conducted in the 1950s and 1960s throughout India such as those conducted in Athoor Block, Tamil Nadu, by the Gandhigram Institute of Rural Health and Family Welfare, at Malur in Karnataka State by the Family Planning Association of India in the 1980s, and in many other areas. The attitudes and views of regional political parties in Tamil Nadu in improving women's status, making people desire a small family, and contributing to reductions in fertility there are discussed in one case study in Chapter 7.

The involvement of political leaders in population policy formation, organization of family planning programs, and designing appropriate IEC strategies helps to overcome the

traditional misconceptions toward fertility control and contraceptive methods. Leaders in developing countries have enormous influence and control over people's perceptions and behavior in all matters of life including family planning. Involvement of political and other community leaders in family planning programs can help to overcome communication barriers between the elite and the masses and perceived physical difficulties in services reaching the people in states like Uttar Pradesh or Rajasthan where there is considerable illiteracy, women's status is low, and facilities are poor.

The two-step flow of communication, from professionals or government officials to the leaders and from the leaders to the people, seems more appropriate and effective than workers' trying to reach people directly and independently without community support. The experiences of the People's Republic of China in involving and using party leaders and cadres for effective control of fertility even in remote rural areas is an excellent illustration of this principle at the national level. Though China is a one-party communist state and India is a multiparty democracy, the successful experience of involving local leaders in the family planning program in China can be useful in the Indian context.

The involvement of political leaders in family planning programs can be achieved by systematically organizing massive educational programs for all leaders and also developing tangible schemes as to what a leader can say and do in the community to promote the small family norm as well as acceptance and use of modern contraception, and maternal and child health services. Developing political will and involving political leaders also helps in toning up the program's administrative and bureaucratic structure and improving its efficiency. Including political leaders in the program also helps in obtaining better financial resources for it at all levels. Thus involving influential opinion leaders in family planning ultimately contributes to strengthening both the demand and supply sides of the program.

Population Policy Formulation at State Level

Since 1951 population policy formulation in India has been the responsibility of the central government in Delhi. This is understandable because after attaining political independence in 1947 there was a common national fervor and felt need for developmental planning initiated for the country as a whole from its capital. Explicit population goals (desired reductions in birth rate), number of acceptors of family planning methods to recruit, budget allocations, and program strategy formulation were all made at the national level as a part of successive five-year plans. The program remained, in essence, a centrally planned, funded, and monitored scheme though responsibilities for its implementation remained with the state governments.

As discussed in Chapters 5 to 7, the impact of these programs during the past 40 years has been different in disparate states. Kerala, Tamil Nadu, and Goa had by 1990 realized the national goals to be met by the turn of the century and are very near replacement levels of fertility. On the other hand, the large Hindi-speaking states of the north (Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh) still have high fertility and lag behind Kerala by over 20 years (Table 4.12). The demographic diversity among the various states seems to have widened because of the differential impact of family planning and public health programs. Though fertility has declined in all the states, it has declined more steeply in some than in others.

Attempts have been made to understand the special problems of the large, northern Hindi-speaking states in effective implementation of family planning programs. Notable among them is a recent large-scale study conducted under the auspices of the UNFPA (Satia and Jejeebhoy, 1991). One lesson learned from that study, as well as from understanding the factors behind the successful fertility transition in Goa, Kerala, and Tamil Nadu, is that political will and specification of demographic goals to meet within given periods should be done at the state level with full responsibility of those political leaders and that bureaucracy. Having a common population policy applicable to Kerala and Uttar Pradesh simultaneously is pointless since they are at the different stages of program implementation and fertility transition. While future efforts in Kerala should be directed toward maintaining the couple protection rate and fertility levels already achieved through good quality services, Uttar Pradesh needs to rethink program strategy, resource allocation, monitoring, and evaluation.

Program strategies must vary from state to state depending on political will, bureaucratic commitments, and socioeconomic context. Hence one of the recommendations of this UNFPA study, endorsed by this analysis, is that in matters of detailed policy formulation and implementation of fertility regulation programs, state governments should be encouraged to play the key role while the central government, functioning as a catalyst, provides financial, technical, and managerial support. India has reached the stage in her demographic transition wherein population policy, program goals, and program strategy should become state responsibilities. National population policy should be general, giving the desired direction of fertility and mortality change and helping state governments to meet their specific goals.

Strategic Planning for Shifting Emphasis from Sterilization to Spacing Methods

Since its inception in 1951, the Indian family planning program has put unduly high emphasis on sterilization--vasectomy until 1977 and female sterilization thereafter. As of March 1990, 45 percent of Indian couples in the reproductive ages have been protected by a modern

method of contraception, of which three-fourths of the total number protected have been sterilized.

Since 1980, there has been a conscious, deliberate attempt of program planners and administrators to shift to spacing methods, but the change seems to be difficult to make. The difficulty arises from many quarters. First, the organizational structure of the family planning program in India centers around a medical doctor, at rural primary health centers, urban welfare centers, or postpartum centers in urban hospitals. Second, doctors and paramedics receive incentives for every sterilization performed or assisted with, in addition to the acceptors of sterilization. Shifting the emphasis to spacing methods involves loss of power and money to the medical and paramedical personnel and so they resist it. Third, program evaluation is based on sterilization equivalents which gives disproportionately high weight to sterilization. One sterilization is considered equivalent to 3 IUD insertions, 1296 condoms distributed, 117 pill cycles distributed, and so on. While using such weights can be justified in assessing the program's fertility impact, their use in monitoring monthly program progress, especially in the context of shifting emphasis to spacing methods, can hardly be justified. Program monitoring indicators should be relevant to the program's strategic goals and measure the efficiency with which spacing methods are made increasingly popular and accessible to couples.

Further, the fertility impact of sterilization in the Indian program seems to have declined during the past decade. There are clear indications of decreasing returns to investment on the method because most couples opt for sterilization after achieving desired family size and after the last child is two or three years old. The age of the mothers, their parity, and potential fertility at the time of the sterilization play a crucial role in determining the fertility impact of the family planning program. The younger the age, lower the parity, and shorter the interval between the last child and the date of sterilization, the higher the women's potential fertility and the greater the impact of sterilization on it.

As discussed in Chapter 5, neither the average age, parity, nor the open birth interval at the time of sterilization has declined over time. There is hardly any change in these parameters over time even though the volume of sterilizations has substantially increased. For example, the average number of living children for tubectomy acceptors has declined only from 3.5 in 1977-78 to 3.3 in 1987-88. It has been estimated that in 1987-88, among wives aged 30-44, as high as 65 percent were protected but among wives aged 15-29, only a moderate 20 percent were protected. Thus the protection offered by the family planning program in India has been largely among older, higher parity women with lower potential fertility (because of longer open intervals)--and this is attributable to the undue emphasis on

sterilization. The situation is like locking the stable after the horses have bolted away. There is no doubt that the program should reach younger, more fertile couples to have a greater impact on fertility; this can be done only by deliberate emphasis on spacing methods. While most other countries started with spacing methods and shifted their emphasis to sterilization, India has the reverse pattern.

Selective Targeting Strategy: the Birth-Based Approach

In the Indian program, all couples of reproductive age have been receiving almost identical attention from program personnel, regardless of their fertility potential. In some states the level of contraceptive use measured by the couple protection rate is high, but so is the crude birth rate, for example, Gujarat, Haryana, and Punjab. In other states, couple protection rates are relatively low, but fertility rates are lower than what may be expected, for example, Goa and Tamil Nadu. Even for the nation, from 1976 to 1986 the crude birth rate has been stagnating at around 32 per thousand per year, while the couple protection rate rose from 24 to 35 percent. The discrepancies between couple protection rates and fertility levels are because of three factors: differentials in natural fertility levels of the population, the potential fertility of acceptors, and use effectiveness of contraceptive methods (see Chapter 6).

Among these three factors, changes in natural fertility of the population, are not under program control, but are determined by socioeconomic, health, and cultural conditions of the population. As discussed in Chapter 2 natural fertility levels in India are rising because of relaxation of the traditional checks on fertility under the influence of modernization, improved health, and better nutrition. The total natural marital fertility rate (TNMFR) of an Indian woman was around six children until 1950. This number has steadily increased and recent estimates indicate that the prevailing TNMFR is around nine children. Thus without deliberate fertility control in India today, a married woman can be expected to give birth to nine children during her reproductive span. While the rising trend in natural fertility has plateaued in states such as Kerala and Tamil Nadu, the trends continue in states like Bihar and Uttar Pradesh. Under these circumstances, even to maintain current fertility levels there should be a rise in the percentage of couples using contraception and attempts should be made to identify couples whose natural fertility levels are likely to rise sharply in the future.

By targeting the program towards potentially more fertile couples, its impact can be enhanced. One criterion to use in identifying the relatively more fecund couples in the population is the recency of births to the women. As discussed in Chapter 6, mothers who have recently delivered infants are self-selected for higher future fertility even after

controlling for age and parity. The family planning program, by targeting maternal and child care, health education, and contraceptive services to mothers who have recently delivered will have greater impact on fertility for any given level of contraceptive use. Such a "birth-based strategy" will also help in meaningful integration of family planning with maternal and child health services. The pregnant woman or recently delivered mother and her husband are likely to be most receptive to the ideas of family planning, spacing, or limitation at this stage. The diffusion of spacing methods of contraception (IUD, pills, injectables, and condoms) can become a significant part of a birth-based strategy of program implementation. Program resources can be channeled to more fecund and vulnerable groups.

Improving Program Management

Since its inception, the Indian family planning program has placed considerable emphasis on incentives, in cash and kind, for promoting family planning acceptance, especially sterilization. Incentives have been offered to acceptors of sterilization and IUDs, to motivators, to medical and paramedical personnel providing the services, to district officials for realizing and surpassing the targets, and to local bodies and state governments as cash awards for outstanding performance. Acceptors, officials, and state governments have come to view sterilization as an economically advantageous proposition. There has been no systematic emphasis on improving the organizational and management aspects of the program and its efficiency and effectiveness. The quality of care given to acceptors at the time of acceptance and follow up services remain woefully poor. As a consequence, many sterilization acceptors have been motivated to adopt the method not because of a strong desire to plan and restrict family size, but because of incentives.

A thorough study of sterilization acceptors in Madhya Pradesh (Ravi Verma et al., 1989) found that almost half of sterilization acceptors report that they would not have accepted the method had no incentive money been offered. Such commercialization of family planning creates a host of problems for program personnel as well as for the people. The program organizational structure at the primary health center level, where services are provided, is almost totally designed for sterilizations and related money transactions. There are no systematic efforts to educate couples on the advantages of spacing births and limiting family size. The quality of care at the time of sterilization or IUD insertion and follow-up care to acceptors continues to remain poor in most states because of the hit-and-run type of strategy adopted in camp-based sterilizations. The plethora of social evils that accompany any incentive-based program such as inflated numbers of acceptors, sterilization of ineligible cases, and corruption tend to become systematized, since all units of the system derive

benefits based on the number of sterilizations done. Thus the ultimate goal of a family planning program, as essentially one to improve family health and well-being, gets lost in the focus on meeting sterilization targets. There is a need for rethinking the advisability of providing any cash incentives to acceptors or providers of family planning services including the state governments. If incentives are provided, they should go to communities for improving their welfare or infrastructure.

A number of studies in India reveal that management of the family planning program at all levels is extremely poor and does not adhere to even basic management principles. A large-scale study by the International Institute for Population Sciences, Bombay (Srinivasan et al., 1991), in four relatively well performing and efficient states, (Karnataka, Maharashtra, Tamil Nadu, and West Bengal) pointed out wastage of program inputs because they are neither used fully throughout the year nor effectively deployed (see Chapter 5).

Partly for this reason, Srinivasan et al. found that all important program input factors of personnel and facilities explained only a smaller than expected proportion of the variability in family planning acceptance at the primary health center level. The percentage of variance in acceptance explained was 13 in Tamil Nadu, 28 in Maharashtra, 39 in West Bengal, and 47 in Karnataka.

In a number of states, a flurry of activities are undertaken to achieve family planning targets in February and March, (the fiscal year being April 1 to March 30). During this period many other government departments, such as revenue and education, are mobilized to "motivate" cases for sterilization. Under such circumstances, the normally expected pattern of input-output relationships between direct program inputs and performance are vitiated. There is a lull for almost ten months from April to December each year, and the program is generally implemented in "fits and starts," depending on the pressures higher authorities give for achieving the targets. There are no systematic or steady efforts in program implementation.

Further, various program inputs are not properly planned and used. For example, numerous primary health centers (PHCs) have doctors trained in sterilizations but no operating rooms, and conversely there are PHCs with operating rooms but no trained doctors. In 1987, 51 percent of PHCs in Tamil Nadu had operation facilities without a trained doctor, and 27 percent in West Bengal had at least one trained doctor in a PHC without an operating room (Srinivasan et al., 1991). Such a mismatch of essential program inputs appear to be quite common. Planning family planning program inputs seems to be done more to fill vacancies and meet targets to secure maximum financial resources from the

center than for effective use of available inputs. There is a deficiency in applying basic management principles at the PHC level.

Better management can be achieved by public health management professionals' giving systematic attention to each primary health center with three aims of restructuring PHC activities:

1. Enabling each worker to contribute to the maximum of his/her technical training
2. Making family planning an integral part of maternal and child health services
3. Making periodic home visits by paramedics and medical personnel an essential activity of all field personnel.

If the birth-based approach recommended above is adopted, the program could reorient its attention to identifying and providing services to all mothers currently pregnant or who delivered a child within the last year. The services should include the minimum of maternal and child health and family planning advice plus activities recommended by WHO and UNICEF and, if possible, more that is feasible within budgetary limits. Such a program is longitudinal and the regularity of the household visit and nature of care provided to mother and child should be specified. Care should include immunizations for the children, tetanus toxoid injections, essential antenatal services to pregnant women, skilled attention during delivery, postnatal care, advice on nutrition, and monitoring of the child's growth and development. Family planning advice and services to mothers should be provided as part of maternal and child health services. Care would be constant with no slack or rush seasons.

The birth-based approach is similar to the earlier postpartum program of family planning except that it is not hospital based, but a domiciliary service system of worker's regular, systematic visits to mothers and children at home. There can be no good family planning program without first identifying recent mothers who are likely to be more fertile than others. It may appear that in its first two or three years, a birth-based program neglects a large number of couples in the reproductive ages who have not recently given birth to children. A more careful analysis of the situation, as described in Chapter 6, reveals that program efforts are directed toward the more fertile women and provided in a more acceptable manner with regularity in follow-up care and services. Quality of care depends on regularity; the higher the number of workers' household visits, the better will be the quality of care; satisfied acceptors will function as good motivators for further acceptance in the community. The "hit-and-run" approach of sterilizations through mass camps cannot be sustained over long periods since lack of good follow-up care is likely to lead to complications and dissatisfaction among acceptors and generate a negative public attitude to the family planning program as a whole, in the long run. The birth-based approach will

ensure that minimum follow-up care to all acceptors is provided at home and will also help to promote spacing methods of contraception--the priority objective of the Indian family planning program at this juncture.

If the strategy above is adopted, program evaluation should be based on appropriate indicators that can help assess its progress as designed and monitor the inputs, activities, and outputs at various levels of the organization, from fieldworkers and above. Evaluation of the program's family planning and fertility impact should try to assess the extent to which pregnant women or recently delivered mothers are covered in the program; the regularity of follow-up visits; the duration of contraceptive use by method tabulated by age, parity, and interval since the last birth; and the distribution of births in the population by birth order and length of last closed interval and open interval.

As the program succeeds in covering by effective contraceptive use more and more pregnant and recently delivered mothers, and the duration of contraceptive use increases, the mean open interval and closed interval will increase and higher order births will decrease. Simple indicators based on a cross-tabulation of births by order and mean closed and open intervals can help monitor the program's demographic impact. As the program expands in coverage and quality, the proportion of higher order births to total births will decrease, the mean of the last closed and open intervals will increase, and fertility rates will decline. The advantage of this approach is that family planning will become internalized with the health services system as a way of life for all mothers in the reproductive ages rather than its being seen as a macrolevel vertically organized program designed by external forces to achieve the demographic goal of replacement-level fertility. It is easier to build political will and support for a program that has become a way of life. A successful family planning program should lose its separate identity and become indispensable in promoting the reproductive health of mothers, children, and the population at large. Such a program does not exclude other educational activities for men, adolescents, and school children, or a focus on the advantages of the small family, population education, AIDS prevention, and other public health measures.

Bureaucratic Efficiency

In India the government family planning program has played the pivotal role in bringing the message of family planning and contraceptive services to the majority of the people. Though voluntary organizations and the nongovernmental sector have played an important part in setting up innovative projects and model schemes in selected areas, the major responsibility for providing contraceptive advice and services to more than 90 percent of eligible rural

couples rests with government agencies and workers. The payoff from any steps to improve effectiveness and efficiency of the operation of government institutions and workers involved in the family welfare program is likely to be far higher in the Indian context.

Most family planning personnel work under government regulations common to the whole bureaucracy. It is difficult to improve the family planning organization beyond a certain level, without improving the effectiveness and efficiency of the entire bureaucracy. However, up to a reasonable level, improvements can be effected in the government's family welfare departments or units on the following lines.

The four M's. The basic principles of management science in maximum use of program resources--men, materials, methods, and money (the four M's)--should be observed at the level of primary health centers, urban welfare centers, and government hospitals. Short-term management consultants with expertise in health and family planning programs can help district family planning officers to prepare a blueprint for improving the activities of each center.

Basic principles of sanitation, hygiene, and sterilization of equipment should be followed with much care and efficiency so that the quality of services offered is improved. With the rapid spread of infection from HIV and other sexually transmitted diseases in India, maternal-child health and family planning services need to be provided with maximum care and concern so that they do not become vehicles for disease transmission. Assistance from the international community and donor organizations in improving service quality in the peripheral health centers will go far, not only in achieving rapid fertility transition, but also in arresting the spread of AIDS in rural India. This calls for urgent action.

Technical cooperation. One malady facing the governmental bureaucracy in India, as in many other countries, is the system's inability to implement a suitable reward and punishment device based on the nature of work employees perform. Personnel, once appointed in government departments, are difficult to remove even if they are found totally inefficient and ineffective. Further, the involvement of politicians, trade unions, and quota systems for reserving jobs based on caste and other considerations tends to work against the effectiveness and efficiency of workers and the system. These are hard-core problems, difficult to be resolved by any magic solutions.

One step that could mitigate the effects of the bureaucracy in this regard is the increased contractual involvement of professionals and experts to monitor and manage district family welfare programs. Program monitoring and evaluation activities can be handed over, in part, to nongovernmental professional groups. Successful district officials from Kerala, Tamil Nadu, Maharashtra, and Goa should be invited to serve as consultants to the program at the

state and district levels in Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh, offering them better salaries and other perks. More can be gained by systematic transfer of technical and professional experiences and manpower from more successful states to less successful ones within India than by transfer of technical and professional know-how from outside India. India's vast pool of highly skilled professional and technical manpower in public health, family planning services, program evaluation, and demography is not fully used. The need is urgent to identify the most successful and effective program officials particularly from the district levels and use their experiences in wider and more complex situations. Technical cooperation among states and programs within India is as important, if not more, as technical cooperation among developing countries or aid from developed countries.

Monitoring information and evaluation system. There is a need to rationalize the monitoring information and evaluation system (MIES) of India's family welfare programs. Field personnel spend a considerable portion of their time maintaining an array of registers and records and preparing weekly, biweekly, and monthly returns for higher officials. Studies show that in many centers, as high as 30 to 40 percent of fieldworkers' time is spent in such activities, diverting them from much needed fieldwork and household visits (Nirmala Murthy, 1976). India needs to remodel its outmoded records-registers-returns (three Rs.) by introducing the benefits of modern technology through the use of personal computers and data storage/retrieval systems to relieve fieldworkers of the burdens of unnecessary record keeping. Experimental action research projects can help provide guidelines for developing and operating such a system. Many such projects have already been undertaken and their results and recommendations should be studied for wider application.

Maximum use of personnel. A guiding principle that should underlie India's health and family welfare programs is that every worker should be required to function to the maximum of his or her technical skills and professional training. A doctor should not do a job that a nurse, midwife, or public health nurse can do. Similarly, a nurse or midwife should not do work that a clerk can do. Systematic application of this principle would provide greater job satisfaction to workers, reduce their frustration levels, and also help to improve the effectiveness and efficiency of the system as a whole.

Skills upgrading. There is a need to upgrade the skills of various categories of personnel in India's family planning program by arranging regular short-term courses at different levels. This training is necessary to introduce newer methods of contraception, develop innovative programs of mass education and communication, and promote potential use of computers for monitoring and evaluating schemes.

DEMAND SIDE ISSUES

Improving Literacy Levels

Modern education is one of the most significant instruments of social change and development. Particularly important is female education in the context of promoting the small family norm, maternal and child health care, use of modern contraception methods, and fertility reductions. India's performance in promoting literacy and education is the most disappointing of its developmental schemes. According to the 1991 census, only 39.3 percent of females aged seven and over could read and write a sentence (Census of India, 1991; Paper 2, 1992); three-fifths of this group, or about 201 million, are illiterate. India has the world's largest pool of illiterate females. Comparison of trends in female literacy rates among 12 large developing countries, reveals that India ranks ninth in literacy with only Bangladesh, Pakistan, and Nigeria below it and the relative ranking has not changed with time (see Chapter 4). The detailed analysis relating contraceptive use and fertility levels with female literacy (Chapter 6), reveals that of all the social and economic variables considered in the analysis, female literacy has the maximum explanatory power. It is the cutting edge for social changes such as increased age at marriage, acceptance of small family norms, better child care, use of contraception, and fertility reduction. The need for giving the highest emphasis to improving female literacy in India can hardly be exaggerated. It is the key variable felt to have contributed to rapid fertility declines in Kerala. With modern advances in educational technology through television via cable channels and video-cassettes, it should be possible to bring the benefits of basic primary education to all India's children.

Programs for Improving Child Survival

The 1980s witnessed a global concern for improvements in infant and child survival programs. Thanks to the initiatives taken by UNICEF and WHO in launching the Universal Program of Immunization (UPI), systematic efforts have been taken almost with a missionary zeal during the past decade to immunize every infant and child against the childhood diseases of diphtheria, whooping cough, tetanus, measles, and polio. In India, under this scheme, more than 80 percent of children under five had been covered by 1990. The percentage of children protected by full immunization against these diseases has varied from about half in Rajasthan and Bihar to close to all in Kerala, Maharashtra, and Tamil Nadu. It is a creditable achievement of the public health program in India, with technical and financial assistance from WHO and UNICEF, to have reached this level of immunization which

involved contacting about 25 million women and 30 million children on at least four different occasions in the last five years to keep needed immunizations on schedule.

Similarly the program of ORT (oral rehydration therapy) has brought the advantages of the modern scientific discovery of the effects of a simple salt-sugar solution in treating diarrhea to millions of Indian children, enhancing their chances of survival from repeated attacks of diarrhea and dysentery.

There is no doubt that infant mortality in India, showing a downward trend since 1988, will continue to decline sharply in future years because of the lagged impact of these efforts. The threshold of herd immunity required to arrest the spread of infectious childhood diseases seems to have been achieved in most Indian states. This is an unprecedented global achievement in terms of organization, logistics, health management, and international cooperation, and more impressive than the smallpox eradication program successfully carried out in the early 1970s. However, such vertical, campaign-based immunization programs must become, instead, routine activities of auxiliary nurse midwives and field health workers in India's basic health care system. The return of malaria in developing countries, particularly in India after the withdrawal of the National Malaria Eradication Program, warns us of the hazards of lack of proper integration of basic health services in the health care systems. The vertical approach in child care, though initially an expedient public health and humanitarian measure, must be effectively taken over as a legitimate part of the basic health care system, with no time lag from the time of withdrawal of the campaigns. In India this requires immediate attention and planning.

There is no doubt that the rapid reductions in infant and child mortality expected in India in the coming decade will contribute to a surge in short-term population growth, but will pave the way for long-term sustained declines in fertility. The problems of achieving replacement levels of fertility in India as a whole, especially in the large northern states, though difficult, are not insurmountable, if the critical issues discussed above are tackled with tact, concern, and care. There is room for optimism in India for regulating fertility to replacement levels by the end of the next decade if not before the end of this decade. The globalization of humanitarian issues such as international schemes for enhancing child survival, maternal reproductive health, alleviation of human suffering from catastrophes of famine, war, and epidemics portend well to the future of mankind as a whole, and to India's population with respect to its fertility transition.

APPENDIX A.

National Population Policy: A Statement of the Government of India

In New Delhi, on 16 April 1976, the Government of India issued a major policy declaration in the form of a statement entitled National Population Policy by Dr. Karan Singh, Minister of Health and Family Planning. The official text is reproduced below.

1. With 2.4 per cent of the world's land area, India has about 15 per cent of the world's people. It is estimated that our population as of 1st January, 1976 has crossed the 600 million mark, and is now rising at the rate of well over one million per month. Since Independence (in 1947) 250 millions have been added, equivalent to the entire population of the Soviet Union with six times the land area of India. The increase every year is now equal to the entire population of Australia which is 2 1/2 times the size of our country. If the present rate of increase continues unchecked our population at the turn of the century may well reach the staggering figure of one billion. Indisputably we are facing a population explosion of crisis dimensions which has largely diluted the fruits of the remarkable economic progress that we have made over the last two decades. If the future of the nation is to be secured, and the goal of removing poverty to be attained, the population problem will have to be treated as a top national priority and commitment.

2. Our real enemy is poverty, and it is as a frontal assault on the citadels of poverty that the Fifth Five-Year Plan (1974-79) has included the Minimum Needs Programme. One of its five items is an integrated package of health, family planning and nutrition. Far-reaching steps have been initiated to reorient the thrust of medical education so as to strengthen the community medicine and rural health aspects, and to restructure the health care delivery system on a three-tier basis going down to the most far-flung rural areas where the majority of our people reside and where child mortality and morbidity are the highest. Similarly, ignorance, illiteracy and superstition have got to be fought and eliminated. In the ultimate analysis it is only when the underlying causes of poverty and disease are eliminated that the nation will be able to move forward to its desired ideals.

3. Nonetheless it is clear that simply to wait for education and economic development to bring about a drop in fertility is not a practical solution. The very increase in population makes economic development slow and more difficult of achievement. The time factor is so pressing, and the population growth so formidable, that we have to get out of the vicious circle through a direct assault upon this problem as a national commitment. The President in

his address to the Joint Session of Parliament this year reiterated the importance of stepping up family planning efforts, and the Prime Minister has on several occasions laid stress upon the crucial role that population control has to play in the movement towards economic independence and social transformation, specially in the light of the 20-Point Economic Programme.

4. Considerable work has been done in our country in the field of family planning, but clearly only the fringe of the problem has so far been touched. In this context, after a thorough and careful consideration of all the factors involved as well as the expression of a wide spectrum of public opinion, Government have decided on a series of fundamental measures detailed below which, it is hoped, will enable us to achieve the planned target of reducing the birth rate from an estimated 35 per thousand in the beginning of the Fifth Plan (1974) to 25 per thousand at the end of the Sixth (1984). Allowing for the steady decline in the death rate that will continue due to the improvement in our medical and public health services and the living standards of our people, this is expected to bring down the growth rate of population in our country to 1.4 per cent by 1984.

5. Raising the age of marriage will not only have a demonstrable demographic impact, but will also lead to more responsible parenthood and help to safeguard the health of the mother and the child. It is well known that very early pregnancy leads to higher maternal and infant mortality. Also, if the women of our country are to play their rightful role in its economic, social and intellectual life, the practice of early marriage will have to be severely discouraged. The present law has not been effectively or uniformly enforced. It has, therefore, been decided that the minimum age of marriage should be raised to 18 for girls and 21 for boys, and suitable legislation to this effect will be passed. Offenses under this law will be cognizable by an officer not below the rank of a Sub-Divisional Magistrate.¹⁰

6. It has been represented by some states that while on the one hand we are urging them to limit their population, those states which do well in this field face reduction of representation in Parliament while those with weak performance in family planning tend to get increasing representation. It is obviously necessary to remedy this situation. It has, therefore, been decided that the representation in the Lok Sabha (lower house of Parliament) and the State Legislatures will be frozen on the basis of the 1971 census until the year 2001. This means in effect that the census counts of 1981 and 1991 will not be considered for purposes of adjustment of Lok Sabha Legislature seats. Necessary constitutional amendment

¹⁰The Sub-Divisions are administrative units below the District level. There are some 1,900 such units in India.

will be brought forward during the current year. Appropriate legislation for other elective bodies will also be undertaken.

7. In a federal system, the sharing of Central resources with the States is a matter of considerable importance. In all cases where population is a factor, as in the allocation of Central assistance to State Plans, devolution of taxes and duties and grants-in-aid, the population figures of 1971 will continue to be followed till the year 2001. In the matter of Central assistance to State Plans, eight per cent will be specifically earmarked against performance in family planning. The detailed procedures in this regard will be worked out by the Planning Commission.

8. While there is a direct correlation between illiteracy and fertility, this is particularly marked in the case of girls' education. Wherever female literacy improves, it has been seen that fertility drops almost automatically. It is, therefore, necessary that special measures be taken to raise the levels of female education, particularly above the middle level for girls as well as non-formal education plans for young women especially in certain backward States where the family planning performance so far has been unimpressive. The same is true with regard to child nutrition programmes, as high infant mortality and morbidity have a direct impact on fertility. The Ministry of Education is urging upon the State Governments the necessity to give these matters higher priority than has been accorded so far and fully earmarking adequate outlays both for girls' education up to the middle level and child nutrition.

9. My Ministry is also in close touch with the Education Ministry with regard to the introduction of population values in the educational system, and the NCERT (National Council of Educational Research and Training) has already made a beginning in bringing out some text books on these lines. It is essential that the younger generations should grow up with an adequate awareness of the population problem and a realization of their national responsibility in this regard. Indeed, if I may venture to say so, exhortations to plan families are more important for the younger generations than for those who have already made their contribution to our demographic profile.

10. The adoption of a small family norm is too important a matter to be considered the responsibility of only one Ministry. It is essential that all Ministries and Departments of the Government of India as well as the States should take up as an integral part of their normal programme and budgets the motivation of citizens to adopt responsible reproductive behavior both in their own as well as the national interest. A directive to this effect is being issued by the Prime Minister to all Ministries of the Government of India, and a letter will also be

addressed by her to all Chief Ministers.¹¹ The performance of family planning in the States will be more carefully and intensively monitored than in the past, and the Union Cabinet will review the situation in depth at least once a year.

11. Experience over the last 20 years has shown that monetary compensation does have a significant impact upon the acceptance of family planning, particularly among the poorer sections of society. In view of the desirability of limiting the family size to two or three it has been decided that monetary compensation (both male and female) will be raised to Rs. 150-if performed with two living children or less, Rs. 100-if performed with three living children and Rs. 70-if performed with four or more children.¹² These amounts will include the money payable to individual acceptors as well as other charges such as drugs and dressings, etc., and will take effect from 1st May, 1976. Facilities for sterilization and MTP (medical termination of pregnancy) are being increasingly extended to cover rural areas.

12. In addition to individual compensation, Government is of the view that group incentives should now be introduced in a bold and imaginative manner so as to make family planning a mass movement with greater community involvement. It has, therefore, been decided that suitable group incentives will be introduced for the medical profession, for Zilla and Panchayat Samitis (district and block councils), for teachers at various levels, for cooperative societies and for labor in the organized sector through their respective representative national organizations. Details of these group incentives are being worked out in consultation with the concerned organizations.

13. Despite governmental efforts at Union, State and Municipal levels, family planning cannot succeed unless voluntary organizations are drawn into its promotion in an increasing measure, particularly youth and women's organizations. There is already a scheme for aiding voluntary organizations, and it has been decided that this will be expanded. Also, full rebate will be allowed in the income tax assessment for amounts given as donations for family planning purposes to Government, local bodies or any registered voluntary organization approved for this purpose by the Union Ministry of Health.

14. Research in reproductive biology and contraception is underway in several of our scientific institutions, and there are some very promising developments which, we hope, will lead to a major breakthrough before too long. This is a great challenge to our scientists, and efforts in this direction will receive special attention so that necessary research inputs are ensured on a long range and continuing basis.

¹¹The Chief Minister is head of the Council of Ministers at the state level.

¹²9 rupees equal US\$1.00 at the official exchange rate in 1976.

15. The question of compulsory sterilization has been the subject of lively public debate over the last few months. It is clear that public opinion is now ready to accept much more stringent measures for family planning than before. However, the administrative and medical infrastructure in many parts of the country is still not adequate to cope with the vast implications of nation-wide compulsory sterilization. We do not, therefore, intend to bring in Central legislation for this purpose, at least for the time being. Some States feel that the facilities available with them are adequate to meet the requirements of compulsory sterilization. We are of the view that where a State legislature, in the exercise of its own powers, decides that the time is ripe and it is necessary to pass legislation for compulsory sterilization, it may do so. Our advice to the States in such cases will be to bring in the limitation after three children, and to make it uniformly applicable to all Indian citizens resident in that State without distinction of caste, creed or community.

16. Some States have also introduced a series of measures directed towards their employees and other citizens in the matter of preferential allotment of houses, loans, etc. for those who have accepted family planning. In this sphere also we have decided to leave it to each individual State to introduce such measures as they consider necessary and desirable. Employees of the Union Government will be expected to adopt the small family norm and necessary changes will be made in their service/conduct rules to ensure this.

17. In order to spread the message of family planning throughout the nation, a new multi-media motivational strategy is being evolved which will utilize all the available media channels including the radio, television (specially programmes aimed directly at rural audiences), the press, films, visual displays and also include traditional folk media such as the jatra (traveler's talk), puppet shows, folk songs and folk dances. The attempt is to move from the somewhat urban-elitist approaches of the past into a much more imaginative and vigorous rural-oriented approach. In this context my Ministry is working in close coordination with the Ministry of Information and Broadcasting, and is also trying to draw the best media talent available in the country into the structuring of the new programme.

18. This package of measures will succeed in its objective only if it receives the full and active cooperation of its people at large. It is my sincere hope that the entire nation will strongly endorse the new population policy which, as part of a multi-faceted strategy for economic development and social emancipation, is directed towards building a strong and prosperous India in the years and decades to come.

APPENDIX B.

Family Welfare Programme: A Statement of Policy

India, Ministry of Health and Family Welfare

(New Delhi, Ministry of Health and Family Welfare, 1977)

The President in his address to Parliament on March 28, 1977, stated that "Family planning will be pursued vigorously as a wholly voluntary programme and as an integral part of a comprehensive policy covering education, health, maternity and child care, family welfare, women's rights and nutrition." The Prime Minister has on a number of occasions underlined the vital importance of family planning as a means of individual and national development and well-being. This Government is totally committed to the Family Welfare Programme and will spare no efforts to motivate the people to accept it voluntarily in their own interest and in the interest of their children as well as in the larger interest of the nation.

2. Family planning has, however, to be lifted from its old and narrow concept and given its proper place in the overall philosophy of welfare. It must embrace all aspects of family welfare, particularly those which are designed to protect and promote the health of mothers and children. It must become a part of the total concept of positive health. At the same time, it must find meaningful integration with other welfare programmes, viz., nutrition, food, clothing, shelter, availability of safe drinking water, education, employment and women's welfare. It will be our endeavor to bring about this integration in a greater degree. We expect the States to do the same.

3. The change in the name of the programme from family planning to family welfare is a reflection of the Government's anxiety to promote, through it, the total welfare of the family and the community. It is our intention to take the programme forward in the real sense as an investment in man. We wish to make it abundantly clear that in this task there is no room for compulsion, coercion or pressures of any sort. Compulsion in the area of family welfare must be ruled out for all times to come. Our approach is educational and wholly voluntary. There will, however, be no slackening of our efforts in this direction.

4. The Government attaches the highest importance to the dignity of citizen and to his right to determine the size of his family. We have no doubt that by and large the people of India are conscious of the importance of responsible parenthood; given the necessary information and adequate services, they will accept the small family norm. We will promote all methods with equal emphasis and it will be left to every family to decide what method of contraception it will like to adopt. Employees of the Union Government, State Governments,

autonomous bodies, local bodies, etc., will be expected to set an example and to adopt the small family norm.

5. We are totally against any legislation for compulsory sterilization either at the Central level or by the States. Sterilization, both male and female, is a terminal method and suitable for those couples who have reached the optimum family size. Services for sterilization will be offered free of cost to those who voluntarily wish to adopt this method. Similarly other services under the programme will be available to the people free of charge. The acceptance of voluntary sterilization and IUD involves to and from travel to a clinic, a brief stay in the hospital, resulting in possible loss of wages which the majority of our people cannot easily afford. In view of this, it has been decided to retain the provision for monetary compensation. Any medical complication resulting from a voluntary sterilization operation will be attended to free of cost; and if in an unfortunate case recanalization becomes necessary, this facility will also be offered to the individual concerned under the best possible professional care without any charge.

6. Nearly 80 per cent of our population lives in villages. Medical services are not able to reach them in an effective way. An integrated rural health scheme is on the anvil and will be implemented shortly. It is of the utmost importance that adequate ante-natal, natal and post-natal care is made available to pregnant mothers. To this end, a comprehensive scheme of training of indigenous midwives (dais) will be implemented. Under it maternity services will be made available to all mothers who may need them. The programme of immunizing children against common diseases such as a whooping cough, diphtheria and tetanus will be expanded further. We expect that the State Governments will give necessary co-operation and assistance in this direction.

7. The direct correlation between illiteracy and fertility and between infant/maternal mortality and the age of marriage is well established by demographic studies. While on the one hand the Government will pursue its policy of according high priority to the improvement of women's educational level, both through formal and non-formal channels, it will also bring legislation for raising the minimum age of marriage for girls to 18 and for boys to 21.

8. In a federal system, the sharing of Central resources with the States is a matter of considerable importance. In all cases where population is a factor as in the allocation of Central assistance to State plans, devolution of taxes and duties and grants-in-aid, the population figures of 1971 will continue to be followed till the year 2001. Family Planning and population control is a subject in the Concurrent List, yet the implementation of the Family Welfare Programme is very much the responsibility of State Governments.

Assistance for the implementation of the programme is provided by the Central Government to the States on a cent-per-cent basis. In order to ensure a purposeful implementation of the Family Welfare Programme, the principle of linking 8 per cent of Central Assistance to the State Plans with their performance and success in Family Welfare Programme will be continued.

9. Population education has so far not received the attention it deserves. The NCERT have developed some models for the introduction of population education in the school education system. These models have already been adopted by the Central Schools Organization. We would urge that the departments of education in the States should adopt these models, or their modified versions, in the syllabus in the schools. Forty-two per cent of our population is below the age of 15 years. It is this population which will soon be entering in the area of matrimony. We must take steps without any further delay to see that the youth receive population education as part of their normal courses of study.

10. The population of India has been increasing at the rate of about one million every month. It has increased by nearly 270 million since 1947 and is today estimated to be 615 million. If the present rate of growth continues, we will be touching the one billion mark by the end of the century. This rate has to be arrested. The birth rate targets of 30 and 25 per thousand by the end of the Fifth and Sixth Plans respectively can be achieved only with the total and willing participation of the community in the family welfare programme. For this purpose it is important that all media of publicity, including motivation through the extension approach, should be utilized fully by the Central and State Governments. We would very much expect that just as at the Centre we have involved all media units of the Ministry of Information and Broadcasting in the motivational campaigns, in the State also the State Departments of Public Relations and other departments having their own publicity set-ups would be totally associated with the motivational effort.

11. It is of equal importance that trade unions, chambers of commerce, cooperative societies, organizations of women, federations of teachers, village panchayats and all other institutions which can influence public opinion should be associated intimately with the educational campaigns. The village panchayats can play a significant role in this task. Their potential as change-agents needs to receive greater recognition and attention.

12. No programme will succeed unless voluntary organizations particularly youth and women's organizations participate in its implementation fully and extensively. So far this participation has been very limited. The Government wishes to invite the suggestions of voluntary organizations and such public bodies as are engaged in the general task of Family Welfare for evolving suitable patterns of cooperation and assistance. Full rebate will be

allowed in the income-tax assessment for amounts given as donations for Family Welfare purposes to Government, local bodies or any registered voluntary organization approved for this purpose by the Union Ministry of Health.

13. While the existing methods of contraception will continue to be available to the people, it is important that the search for newer methods should be intensified. The Government will give special attention to the necessary research inputs in the field of reproductive biology and contraception.

14. The programme and the approach for implementation of the Family Welfare Programme as outlined in the above paragraphs will succeed only if there is willing cooperation from all in full measure. The Family Welfare Programme embraces all the principal areas of human welfare. It will be wrong to leave it only to the Ministry of Health and Family Welfare in the Centre and their counterparts in the States. It is essential that all Ministries and Departments of the Government of India as well as of the States give due importance to this Programme and work for its furtherance. The performance of Family Welfare in the States will be intensively and carefully monitored and the Union Cabinet will review the situation in depth at least once a year. Suitable machinery for ensuring coordination with other connected programmes of welfare may be set up in the States also.

APPENDIX C.
Trends in Agricultural Production in India (Total Volume in Millions of Tons and Index Values)

Item	Years									
	1950-51	1960-61	1970-71	1980-81	1982-83	1985-86	1986-87	1987-88	1988-89*	1989-90
Cereals (million tons)	42.4 (53.8)	69.3 (82.6)	96.6 (114.1)	119.0 (143.1)	117.7 (139.8)	137.1 (167.5)	131.7 (160.4)	129.4 (156.5)	156.1 (190.2)	158.1 (192.5)
Pulses	8.4 (81.6)	12.7 (112.3)	11.8 (104.4)	10.6 (95.8)	11.9 (106.4)	13.4 (120.1)	11.7 (105.7)	11.0 (99.5)	13.8 (125.2)	12.6 (114.4)
Total Foodgrains	50.8 (57.1)	82.0 (86.1)	108.4 (112.9)	129.6 (137.5)	129.5 (135.8)	150.4 (161.9)	143.4 (154.0)	140.4 (149.8)	169.9 (182.5)	170.6 (183.3)
Oilseeds	5.2 (66.1)	7.0 (89.8)	9.6 (116.1)	9.4 (113.6)	10.0 (125.1)	10.6 (126.7)	11.3 (125.1)	12.7 (139.1)	17.7 (192.5)	16.5 (185.5)
Cotton	3.0 (54.3)	5.6 (99.2)	4.8 (85.1)	7.0 (125.1)	7.5 (134.5)	8.7 (155.8)	6.9 (123.3)	6.4 (113.9)	8.7 (156.1)	11.4 (203.6)
Total Nonfoodgrains	(62.0)	(88.1)	(108.6)	(130.5)	(141.1)	(150.9)	(149.2)	(154.5)	(184.8)*	(193.1)
All Crops	(58.5)	(86.7)	(111.5)	(135.2)	(137.5)	(158.4)	(152.5)	(151.3)	(183.2)*	(186.4)
Agriculture as Percentage of GDP (at current prices)	(49.5)	(48.0)	(45.7)	(34.7)	(30.6)	(26.4)	(28.6)	(27.8)	-	-

*Provisional

Note: Numbers in parentheses are index numbers with base on triennium ending 1969/70=100. In 1950-51 and 1960-61, oilseeds include groundnuts, rapeseed and mustard, sesamum, linseed, and castor seed. From 1970-71, it also includes nigerseed, safflower, sunflower, and soybean.

Sources: 1) Table 9.7 (based on data from Ministry of Agriculture) in SITUATION AND PROSPECTS OF THE INDIAN ECONOMY. World Bank Document Report No. 4962-In 1984, Vol. III, p. 59-60.

2) Government of India, ECONOMIC SURVEY 1990-91, Table 1.9, p. S-13.

3) Government of India, (C3SO), STATISTICAL ABSTRACT OF INDIA 1989, Table 3, p. 51-58.

4) STATISTICAL OUTLINE OF INDIA 1986-87 (Bombay: Tata Services Ltd.), Table 10, p. 19 and Table 11, p. 20.

5) STATISTICAL OUTLINE OF INDIA 1987 (Bombay: Tata Services Ltd.), Table 10, p. 10 and Table 11, p. 20.

6) Central Statistical Organization, 1989, BASIC STATISTICS RELATING TO INDIAN ECONOMY 1989, Table 21, p. 30, Table, 24, p. 36, Table 8, p. 16.

7) Centre for Monitoring Indian Economy, Economic Intelligence Service, ECONOMIC OUTLOOK, December 1990, Table 4.2, p. 22.

APPENDIX D.

Changes in Selected Economic Characteristics of 12 Large Developing Countries

Country	Population (in millions)	Density (per km ²)	Average Annual GDP Growth Rate (%)		GNP per Capita (US \$)	GDP (millions of dollars)		Agriculture as Percentage of GDP		Fertilizer Consumption	
	Mid-1989	1989	1965-80	1980-89	1989	1965	1989	1965	1989	1970/71	1987/88
China	1113.9	116	6.9	9.7	350	67200	417830	44	32	410	2361
India	832.5	253	3.6	5.3	340	50530	235220	44	30	137	517
Indonesia	178.2	94	7.0	5.3	500	3840	93970	56	23	133	1068
Brazil	147.3	17	9.0	3.0	2540	19450	319150	19	9	166	485
Bangladesh	110.7	769	2.5	3.5	180	4350	20240	53	44	157	770
Nigeria	113.8	123	6.1	-0.4	250	5850	28920	54	31	2	94
Pakistan	109.9	138	5.2	6.4	370	5450	35820	40	27	146	829
Mexico	84.6	43	6.5	0.7	2010	21640	200730	14	9	232	757
Philippines	60.0	200	5.9	0.7	710	6010	44350	26	24	267	612
Thailand	55.4	108	7.3	7.0	1220	4390	69680	32	15	59	328
Turkey	55.0	71	6.2	5.1	1370	7660	71600	34	17	157	637
Egypt	51.0	51	7.3	5.4	640	4550	31580	29	19	1312	3505

Note: Hundreds of grams of plant nutrient per hectare of arable land.

Sources: World Bank, 1991, Tables 1-4.

APPENDIX E.**Trends in Industrial Production in India (Volume)**

Industry	1950-51	1960-61	1970-71	1980-81	1983-84	1985-86	1986-87	1988-89 ^c	1989-90 ^d
Iron-ore	3.0	11.0	32.5	42.2	39.0	47.7	52.7	49.5	50.7
Aluminum	4.0	18.5	168.8	199.0	220.3	264.8	257.3	357.3	427.1
Machine Tools	3	8	430	1692	2697	2914	3571	6107	6480
Cotton Textile Machinery	NA	104	303	3027	3512	3652	3961	4840	6288
Automobiles	16.5	54.8	87.9	121.1	158.4	219.2	235.8	317.2	351.1
Power Driven Pumps	35	105	259	431	492	612	459	593	468
Bicycles	99	1063	2042	4189	5395	5553	6119	6703	6658
Electric Lamps	16.0	43.5	119.3	198.1	275.1	270.1	283.7	247.5	249.4
Nitrogenous Fertilizers	9	99	830	2164	3491	4328	5410	6712	6742
Phosphatic Fertilizers	9	54	229	842	1048	1428	1660	2252	1792
Cement	2.7	8.0	14.3	18.6	27.1	33.1	36.5	44.3	45.8
Cotton Cloth	4215	6738	7602	8368	8741	12467	12727	12255	12738
Sugar	1134	3029	3740	5148	5909	7003	8502	8716	10829
Electricity Generated ^f	5.1	16.9	55.8	110.8	140.2	170.4	187.7	221.1	245.1

NA = not available; ^aProvisional

^amillion tonnes; ^bthousand tonnes; ^cmillion rupees; ^dthousands; ^emillions; ^fbillion kilowatt hours

Source: Government of India, ECONOMIC SURVEY 1990-91, Table 1.31

APPENDIX F.
Trends in Index Values of Industrial Production (Base 1970 = 100)

Industry Group	Years										
	1951	1960	1971	1981	1984	1985	1986-87	1987-88	1988-89	1989-90	1990-91
Food Manufacturing	41.8	62.5	98.1	141.7	158.4	161.8	171.5	179.0	191.1	194.5	215.3
Textile Manufacturing	72.1	90.4	99.9	116.2	111.1	117.8	117.5	125.1	114.9	118.7	139.9
Paper & Paper Products	17.7	46.1	104.3	148.0	172.0	183.5	201.7	205.5	211.6	224.3	244.2
Chemicals & Chemical Products	18.2	42.9	112.2	207.6	249.6	258.5	294.0	335.9	391.0	414.0	423.3
Products of Petroleum & Coal	3.7	33.5	106.2	160.6	191.5	222.8	217.4	227.9	346.6	252.0	251.0
Machinery (except electrical)	5.4	24.5	115.9	234.1	267.2	285.9	311.4	305.3	352.3	378.0	406.3
Electrical Machinery & Appliances	7.1	27.1	105.4	180.0	189.5	201.3	255.6	336.4	351.9	459.2	565.2
General Index of Industrial Production	29.7	54.3	104.4	164.6	192.6	205.3	224.1	240.4	261.3	283.0	306.3
Electricity Generated	18.7	29.9	107.2	220.4	279.8	302.3	333.4	359.6	393.1	435.1	473.2

*Provisional

Sources: Central Statistical Organization, MONTHLY STATISTICS OF THE PRODUCTION OF SELECTED INDUSTRIES OF INDIA, March 1979, Vol II.
 Central Statistical Organization, MONTHLY ABSTRACT OF STATISTICS (Various Issues)
 World Bank, STATISTICS AND PROSPECTS OF THE INDIAN ECONOMY - A MEDIUM TERM PERSPECTIVE, Vol. III Report No. 4962-I (World Bank Document - 198 p. 66.
 Govt. of India, ECONOMIC SURVEY 1990-91, Table 1.32, p. S-38.

APPENDIX G.

Glossary of Terms Used in the Volume

INDIAN CULTURAL TERMS

Advaita: School of Hindu philosophy that argues for monism or a unified principle underlying all plurality.

Ahimsa: Non-injury to humans and animals.

Aryan: Early invaders and settlers of the Indian sub continent.

Bhagavat Gita: Song Celestial; a sacred religious text for the Hindus.

Brahmachari: A celibate, pursuing interest in studies and spiritual matters.

Caste: A Hindu social order that stratifies the population into four major groups, by birth, and also assigns a hierarchial status to them; the most backward castes who were socially and economically exploited for thousands of years by the higher castes have, since the attainment of political independence and institution of a democratic form of government, asserted their political and social rights and have quotas reserved for them in education, employment and other privileges from the government. They are called 'Scheduled Castes' since they have been included caste by caste in a schedule attached to the Constitution of India as groups that are to be given special privileges.

Dharma: Sacred laws for the Hindus, violation of which is a moral and spiritual sin, for which the consequences will follow in this or the next birth.

Dowry: The equivalent term in Sanskrit is "Vara-dakshina", literally meaning gift to the bride groom over the centuries this has become an ingrained custom in the Hindu society, whereby the parents of the bride have to shell out considerable sums of money, golden jewelry, cattle, vessels etc. Huge expenditures are incurred at the time of marriage of their daughter by the parents.

Dravidians: Literally means people of the south; the people living in South India are considered to be ethnically different and their languages differ linguistically from the north Indian or Aryan languages.

Karma: Literally means a duty that has to be discharged; it also means the effect of former deeds, performed in this life or in a previous one, on one's present and future condition.

Mahabharatha: A classic epic story of the rise and fall of a ruling dynasty in ancient India; contains thousands of short stories with a moral or social value; the celestial song Bhagavat Gita is embedded in this epic. Stories from this epic are told to children by parents and

grandparents. They are also dramatically enacted through dance and drama in all the languages throughout the country, as a part of the festival seasons.

Marumakkathayam: Matrilineal family system of Malabar or Kerala.

Ramayana: The most popular classical epic of India portraying the life and story of King Rama who undergoes enormous deprivations and sufferings in order to uphold 'dharma' and protect the good and the truthful. Rama the hero of Ramayana and Krishna of Mahabharatha are considered as incarnations of God Vishnu (the god who protects and preserves) who came to this world to safeguard truth and virtue. They are the most popular deities in the Hindu pantheon of gods. Rama had two sons (twins) and Krishna had none. They are quoted at times in family planning motivational programs as capable of achieving what they did (at least to some extent) in their lifetimes because of their controlled family. There are also innumerable stories in these two epics that portray how a person with a large family suffers in this world. These two epics do support regulation of the family size for a couple on the basis of his responsibilities to be discharged to their children. The Hindu religion, in essence, supports a planned family.

Punya: A morally and spiritually good deed that is supposed to be well rewarded in this or subsequent births.

Upanishads: Hindu mystical texts of very ancient origin dealing with basic issues of life and death of man and his relationship to God. They are considered part of the Vedas. There are believed to be six major Upanishads and innumerable smaller ones.

Vedas: Literally means store house of knowledge. They are the ancient Sanskrit texts that are considered to be the basis of Hinduism. Any conflict or confusion on spiritual matters is resolved by reference to the Vedas or Upanishads in Hinduism.

HEALTH AND FAMILY PLANNING PROGRAM TERMS

ANM (Auxiliary Mid-Wife): a female paramedical worker responsible at the peripheral level for maternal and child health services including motivation for family planning, IUD insertion or supply of oral pills. In the government program at present there is one ANM per 5,000 population on an average in the country, though there is a considerable variation from state to state. She forms the backbone of family planning and child health services in the country. As of March 1990 about 140,000 ANMs were functioning in the rural and urban areas of the country. In states wherein additional public health responsibilities are added on to the ANM and there is a male counterpart they are designated as a Multi-Purpose Worker (MPW)-Female and Multi-Purpose Worker (MPW)-Male respectively.

BEE (Block Extension Educator): a person responsible for the conduct of the educational and motivational programs in health and family planning at the Block Level (Development Block), with a population of approximately 100,000. In some states the BEE is also called the **Block Health Educator** or **BHE**. As of March 1990 about 6,000 were working in the rural areas.

Community Health Worker (CHW) See VHG

Community Health Volunteer (CHV) See VHG

DAI: Traditional birth attendant in the rural areas, usually belonging to certain specified caste groups. A scheme has been introduced to train these women in basic principles of maternal care and hygienic delivery practices during the past two decades. Some states have introduced the scheme of paying them for each delivery conducted in a safe manner. Their assistance is also routinely sought for organization of immunization programs for children and family planning motivation of recently delivered mothers. As of March 1990 there were an estimated 685,000 dais in the country from among whom 593,000 or 87% had undergone a training program at the PHC level.

LMO (Lady Medical Officer): Planned to have one for each Primary Health Center, solely responsible for all family planning activities including female sterilization, IUD insertion and checking suitability of a woman for oral pills at the PHC.

MPW (Multi-Purpose Worker): at the peripheral level, the MPW-male is a counterpart of an ANM, responsible for public health and sanitation activities; usually a trained sanitarian; also responsible for motivating husbands for family planning, distribution of condoms, vasectomy camp organization and coordination of family planning work with the ANM. Though it was planned that both the male and female worker would cover approximately the same population, in practice there are far less number of MPW-males compared to MPW-females or ANMs in the country. As of March 1990, there were only 82,000 male MPWs working in the program compared to 140,000 female MPWs.

PHC (Primary Health Center): the network of government run health units in the rural areas set up in the country after independence in 1951 on the basis of the recommendations of the Health Survey and Development committee set up in 1946 (called the Bhole Committee). Originally planned as one unit for every community development block of approximately 100,000 population, the center was to provide all the basic health services, including sanitation, communicable disease control, maternal and child health services and essential medical services to the people in the rural areas. Family planning was added to the list of their services in the Third Five-Year Plan, 1961-66. The present plan is to have one PHC for every 30,000 population and to have one Community Health Center or a referral center with specialized medical services for every four PHCs. As of March 1990, there were approximately 21,000 functioning PHCs in the country and they form the backbone of public health and family planning programs in India.

VHG (Village Health Guide): a non-official selected for each village or a population of 1,000 to serve as a liaison between the health program officials and the community. Usually a village leader interested in the health of the community and responsible for organizing educational programs and assist the officials in the delivery of services. The VHG's were given an initial training in the basics of public health and health programs in the state and the district. He or she also serves as a depot holder for the distribution of condoms and some basic drugs in the community. He is given a small monthly honorarium. In some states the VHG is or has been called the **Community Health Worker (CHW)** or **Community Health Volunteer (CHV)**. The scheme is patterned on the model of 'bare-foot doctors' in China. Recently in many states these workers have formed associations of their own and demanded that they be also be considered as full time government employees and paid salaries at government rates. As of March '90 about 410,000 VHG's had been trained; of those about 239,000 (among whom 87,000 are females) were actually working in rural areas.

BIBLIOGRAPHY

- Agarwala, S. N. 1962. *Age at Marriage in India*. Allahabad: Kitab Mahal Publications.
- Allan, J. et al. 1969. "The Cambridge Shorter History of India." S. Chand and Co., Third Edition Reprint, New Delhi, p. 701-702.
- Antony, T. V., K. Srinivasan, and P. C. Saxena. 1989. Case Studies of Population Policies and Programmes in India. *Strategic Management of Population Programmes*. Edited by Gayl Ness and Ellen Sattar. Kuala Lumpur, Malaysia: International Council on Management of Population Programmes, 219-56.
- Basham, Arthur Llewellyn. 1963. *The Wonder That Was India. A Study of the History and Culture of the Indian Sub Continent before the Coming of the Muslims*. New and rev. ed. New York: Hawthorn Books.
- Biswas, A. and S. P. Agarwal. 1985. *Development of Education in India. A Historical Survey of Educational Documents Before and After Independence*. New Delhi: Concept Publishing Company.
- Bongaarts, John. 1978. "A Framework for Analyzing the Proximate Determinants of Fertility." *Population and Development Review* 4:105-32.
- Brass, William. 1975. "Methods for Estimating Fertility and Mortality from Limited and Defective Data Based on Seminars Held 16-24 September 1971 at the Centro Latinoamericano de Demografia (CELADE), San Jose, Costa Rica." Chapel Hill: International Program of Laboratories for Population Statistics, Department of Biostatistics, The Carolina Population Center, University of North Carolina at Chapel Hill.
- Caldwell, John C., P. H. Reddy and Pat Caldwell. 1984. *Causes of Fertility Decline in South India*. New York: Population Council Program on the Determinants of Fertility in Developing Countries.
- Cassen, Robert H. 1978. *India: Population, Economy, Society*. New York. Holmes & Meier.
- Centre for Monitoring Indian Economy. Economic Intelligence Service. 1992. *Basic Statistics Relating to the Indian Economy*. Bombay.
- Centre for Monitoring Indian Economy. Economic Intelligence Service. 1992. *Elighth Five Year Plan: 1992-97. A Comparative Picture*. Bombay.
- Chandrasekaran, C. 1954. "Fertility Trends in India." In *World Population Conference, Rome, Italy, Aug. 31-Sept. 10, 1954. Proceedings*. New York: United Nations, 827-40.
- Chandrasekaran, C. et al. 1985. "Has 'Modernization' Increased Fertility in Karnataka, India?" *Demography India*, 14(2):174-196.
- Cleland, John and Christopher Wilson. 1987. "Demand Theories of the Fertility Transition: An Iconoclastic View." *Population Studies*. London. Vol. 41. p. 5-30.
- Coale, Ansley J. 1965. Factors Associated with the Development of Low Fertility: An Historic Summary. In United Nations World Population Conference, Belgrade, Yugoslavia, Aug. 30-Sept. 10, 1965 (collected papers). Vol. 2. New York: United Nations, 322-26.
- Coale, Ansley J. and Edgar M. Hoover. 1958. *Population Growth and Economic Development in Low Income Countries*. Princeton University Press, Princeton.

- Coale, Ansley J. and T. J. Trussell. 1974. Model Fertility Schedules: Variations in the Age-Structure of Childbearing in Human Population." *Population Index* 40:185-258.
- Crimmins, Eileen M., Richard A. Easterlin, Shireen J. Jejeebhoy and Krishnamurthy Srinivasan. 1984. New Perspectives on the Demographic Transition: A Theoretical and Empirical Analysis of an Indian State, 1951-1975. *Economic Development and Cultural Change* 32:227-253.
- Dandekar, Vishnu Majadep and Kumudini Dandekar. 1953. *Survey of Fertility and Mortality in Poona District*. Publication No. 27. [Poona, Gadgil]: Gokhale Institute of Politics and Economics, 97.
- Davis, Kingsley. 1951. *The Population of India and Pakistan*. Princeton University Office of Population Research. New York: Russell & Russell.
- Diehl, Anita. 1977. *E. V. Ramaswami Naicker-Pertiyar: A Study of the Influence of a Personality in Contemporary South India*. Lund Studies in International History no. 10. Stockholm: Esselte Studium.
- D'Souza, Bento Graciano. 1975. *Goan Society in Transition: A Study in Social Change*. Bombay: Popular Prakashan.
- Durbin, J., and G. S. Watson. 1951. "Testing for Serial Correlation in Least-Squares Regression II." *Biometrika* 38:159-78.
- Dyson, Tim P. and Nigel R. Crook. 1984. *India's Demography: Essays on the Contemporary Population*. Atlantic Highlands, NJ: Humanities Press.
- Dyson, Tim P. and Michael J. Murphy. 1985. The Onset of Fertility Transition. *Population and Development Review* 11:399-440.
- Dyson, Tim P. and Michael J. Murphy. 1986. "The Historical Demography of Berar, 1881-1980." Paper presented to the Department of Demography, Australian National University. Canberra, August 1986.
- Easterlin, Richard A. 1978. The Economics and Sociology of Fertility: A Synthesis. In *Historical Studies of Changing Fertility*, edited by Charles Tilly. Princeton, NJ: Princeton University Press, 57-133.
- Easterlin, Richard A. and Eileen M. Crimmins. 1985. *The Fertility Revolution: A Supply-Demand Analysis*. Chicago: University of Chicago Press.
- Freedman, Ronald. 1975. The Sociology of Human Fertility: An Annotated Bibliography. New York: Irvington.
- Freedman, Ronald and Bernard Berelson. 1976. "The Record of Family Planning Programs." Studies in Family Planning 7:1-40.
- Gandhi, Mahatma K. *Birth-Control: The Right Way and the Wrong Way*. Compiled from his speeches, writings and correspondences by R. K. Prabhu, Navajivan Publishing House, Ahmedabad, 1959.
- Gandhi, Mahatma K. 1925. *Young India March 12, 1925, on Birth Control*. Compiled by T.K. Prabhu, p. 5.
- Gandhi, Mahatma K. 1936. *Navajivan*. Ahmedabad: Sabarmati Asram. On Birth Control, Compiled by R.K. Prabhu, p. 31.

- Guttmacher, Alan F., and Irwin H. Kaiser. 1986. *Pregnancy, Birth and Family Planning*. A Plume Book. New York: New American Library.
- Gowen, Herbert. 1931. "A History of Indian Literature." Appleton, London. p. 172, 192.
- Hastings, Donald W. and Walter W. Robinson. 1975. "Open and Closed Birth Intervals for Once-Married Spouse-Present White Women." *Demography* 12:455-66.
- Henry, Louis. 1961. Some Data on Natural Fertility. *Eugenics Quarterly* 8-2:81-91.
- Hernandez, Donald J. 1984. *Success or Failure? Family Planning Programs in the Third World*. Westport, CT: Greenwood Press.
- Himer, Norman. 1963. "Medical History of Contraception." Garment Press, New York. p. 114-124.
- Hutton, John Henry. 1932. Report of the Census of India 1931. Vol. 1; p. 1-32.
- India, 1992. Eighth Five-Year Plan, Chapter 2, p. 31.
- India, Directorate of Health and Family Welfare. 1989. *Health Information of India, 1971-81*. New Delhi: Central Bureau of Health Intelligence.
- India, Government of. 1945. *Bengal Famine Inquiry Commission (Woodhead Commission) Final Report*. New Delhi, 96-98.
- India, Government of. 1946. *Report of the Health Survey and Development Committee (Bhore Committee); Vol II Recommendations*. New Delhi, 485-87.
- India, Government of. 1989. Report of the Standing Committee on Population Projects. Table 4.2.
- India Ministry of Health and Family Planning. 1976. "National Population Policy: A Statement of the Government of India." 16 April, New Delhi (included in Appendix A).
- India, Ministry of Health and Family Welfare. 1977. *Family Welfare Programme--A Statement of Policy*. New Delhi (included as Appendix B).
- India, Ministry of Health and Family Welfare. c.1991a. *Action Plan for Revamping the Family Welfare Programme in India*. New Delhi.
- India, Ministry of Health and Family Welfare. c.1991b. *Population control. Challenges and Strategies*. New Delhi.
- India, Ministry of Health and Family Welfare. 1991. *Analytical Review of Couple Protection Rates, 1990*; by P.N. Kapoor et al. New Delhi.
- India, Ministry of Health and Family Welfare. Department of Family Welfare. January 1990. *Family Welfare Programme in India. Year Book 1988-89*. New Delhi.
- India, Ministry of Health and Family Welfare. Department of Family Welfare. May 1991. *Family Welfare Programme in India. Year Book 1989-90*. New Delhi.
- India, Ministry of Home Affairs. Office of the Registrar General. Vital Statistics Division. 1988. *Census of India, 1981. Occasional Papers no. 4*. New Delhi.

- India, Ministry of Home Affairs. Office of the Registrar General. Vital Statistics Department. Sample Registration System. Publications 1970-75, 76-78, 79-80, 81-88. New Delhi: Ministry of Home Affairs.
- India, Planning Commission. 1980. *Report of the Working Group on Population Policy*. New Delhi.
- India, Planning Commission. 1989. *Report of the Standing Committee on Population Projections*. New Delhi.
- India, Registrar General. 1951. *Census of India*. Paper 1 of 1951.
- India, Registrar General. 1964. 1961 Census Life Tables. New Delhi.
- India, Registrar General. 1964. *Census of India, 1961 Social and Cultural Table, Series-1, Part II C (ii)*. New Delhi.
- India, Registrar General. 1964. *Vital Statistics of India for 1961*. New Delhi, p. 21.
- India, Registrar General. 1970. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1971. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1971-72. Survey of Causes of Death (Rural). *Annual Reports*. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1972. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1973. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1974a. *Census of India, 1971 Social and Cultural Table, Series-1, Part II C (ii)*. New Delhi.
- India, Registrar General. 1974b. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1974c. *SRS Bulletin (New Delhi) 8(2,3)*.
- India, Registrar General. 1975. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1976. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1976b. *Survey of Causes of Death (Rural)*. *Annual Reports*. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1977. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1978. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1979. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1979. *Survey Report on Levels, Trends and Differentials in Fertility*. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1980. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1981a. *Reports and Tables Based on 5 Percent Sample Data*. Series 10. New Delhi:

- India, Registrar General. 1981b. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1981c. *SRS Bulletin* [New Delhi] 23(1).
- India, Registrar General. 1981d. *Survey of Causes of Death (Rural). Annual Reports*. New Delhi: Ministry of Home Affairs, Table 4.2.
- India, Registrar General. 1982. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1983. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1982. *Census of India, 1981 Social and Cultural Table, Series-1, Part II C (ii)*. New Delhi.
- India, Registrar General. 1984. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1985. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1986. Sample Registration System, 1984, statement 25. New Delhi: Vital Statistical Division, Ministry of Home Affairs.
- India, Registrar General. 1987. *Sample Registration System, 1984*. New Delhi: Vital Statistics Division. Ministry of Home Affairs.
- India, Registrar General. 1988. Sample Registration System. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1989a. Sample Registration Bulletin. New Delhi: Office of the Registrar General of India.
- India, Registrar General. 1989b. Survey of Causes of Death (Rural). Annual Reports. New Delhi: Ministry of Home Affairs.
- India, Registrar General. 1990. *SRS Bulletin* 24(2). Office of the Registrar General of India. New Delhi.
- India, Registrar General. 1991a. *Census of India 1991, Provisional Population Totals, Rural-Urban Distribution, Paper 2 of 1991*. Office of the Registrar General. New Delhi.
- India, Registrar General. 1991b. *Census of India, Provisional Population Totals, Series 1, India, Paper 1 of 1991*. Office of the Registrar General. New Delhi.
- India, Registrar General. 1992. *Census of India 1991, Final Population Totals: Brief Analysis of Primary Census Abstract.* India, Paper 2 of 1992. New Delhi.
- India, Vital Statistics Division. 1976 (formerly a). *Fertility Differentials in India: Results of the Fertility Survey in a Sub-sample of SRS, 1972*. New Delhi: Vital Statistics Division, Office of the Registrar General, Ministry of Home Affairs.
- Indian Statistical Institute. 1963. *National Sample Survey, fourteenth round, July 1958-June 1959. No. 76, Fertility and Mortality Rates in India*. New Delhi: Government of India, Cabinet Secretariat, p. 12.
- Inkeles, Alex and David H. Smith. 1974. *Becoming Modern*. Cambridge, MA: Harvard University Press.

- Jain, Anrudh K. 1984. "The Impact of Development and Population Policies on Fertility in India." *Studies in Family Planning* 16:181-98.
- Jain, Anrudh K. 1985. "The Impact of Development and Population Policies on Fertility in India." *Studies in Family Planning* 16:181-198.
- Jain, Anrudh K. and Arjun L. Adlakha. 1982. "Preliminary Estimates of Fertility Decline in India During the 1970s." *Population and Development Review* 8:589-611.
- Jain, Anrudh K. and Prarvinchandra Visaria, eds. 1988. Infant Mortality in India: Differentials and Determinants. New Delhi: Sage.
- Jejeebhoy, Shireen J. 1985. "Women's Status and Fertility in Tamil Nadu, India, 1980." In *Rockefeller Foundation's Workshop on Women's Status and Fertility, Mt. Kisco, N.Y., June 25-28, 1985; Collected Papers*. New York: Rockefeller Foundation, 47-79.
- Jejeebhoy, Shireen J. 1991. Women's Status and Fertility: Successive Cross-Sectional Evidence from Tamil Nadu, India, 1970-1980. *Studies in Family Planning* 22:217-230.
- Karve, R.D. 1927 (Ed.) 'Samaj-Swasthya' (Journal in Maratha language). Volume I, No. 1, March 27, Bombay.
- Karve, R.D. 1931. "Birth Control Theory and Practice." Fourth Edition, Bombay, Right Agency. p. 123.
- Keith, Berridale. 1928. "A History of Sanskrit Literature." Oxford Press, London. Chapter XXIV.
- Krishnan, K. S. 1986. The Survey of Causes of Death (Rural) in India--An Appraisal. In *Report of the Workshop on Statistics of Cause of Death*. New Delhi: Office of the Registrar General, 93-105.
- Kumar, Joginder. 1971. "A Comparison between Current Indian Fertility and Late Nineteenth-Century Swedish and Finnish Fertility." *Population Studies* 25(2):269-82. p. 270.
- Lapham, Robert J. and W. Parker Mauldin. 1985. "Contraceptive Prevalence: The Influence of Organized Family Planning Programs." *Studies in Family Planning* 16:117-37.
- Mari Bhat, P. N. 1978. *Age Patterns of Marital Fertility in India*. Bangalore, India: Institute for Social and Economic Change (mimeographed).
- Mari Bhat, P. N. 1989. "Mortality and Fertility in India, 1881-1961: A Reassessment." In *India's Historical Demography: Studies in Famine, Disease and Society*, edited by Tim P. Dyson. London: Curzon Press; Riverdale, MD.
- Mari Bhat, P. N. 1991. "ORG Surveys of Family Planning Practice in India, A Statistical Review." *Journal of Institute of Economic Research [Dharwad]* 16(1, 2):71-88.
- Mari, Rushikesh. 1989. "Strategic Management of Population Programs," Chapter 1 in *Strategic Management of Population Programs*. Gayl Ness and Ellen Sattar Eds., ICOMP, Kuala Lumpur, February, p. 1-12.
- Mauldin, W. Parker and John A. Ross. 1991. Family Planning Programs: Efforts and Results, 1982-89. *Studies in Family Planning* 22:350-367.

- Misra, Bhaskar D., Ali Ashraf, Ruth S. Simmons, and George B. Simmons. 1982. *Organization for Change: A Systems Analyses of Family Planning in Rural India*. Center for South and Southeast Asian Studies, Paper no. 21. Ann Arbor: Center for South and Southeast Asian Studies, University of Michigan.
- Mukerjee, Radhakamal. 1959. *The Culture and Art of India*. London: Allen & Unwin.
- Mukherjee, Sudhansu Bhusan. 1976. *The Age Distribution of the Indian Population: A Reconstruction for the States and Territories, 1881-1961*. Honolulu: East-West Center, East-West Population Institute.
- Nag, Moni. 1979. "How Modernization Can Also Increase Fertility." Working paper, no. 49. New York: Center for Policy Studies, The Population Council.
- Nag, Moni. 1982. *Modernization and Its Impact on Fertility: The Indian Scene*. New York: Center for Policy Studies, The Population Council.
- Nag, Moni. 1983. *The Equity-Fertility Hypothesis as an Explanation of the Fertility Differential Between Kerala and West Bengal*. New York: Center for Policy Studies, The Population Council.
- Nag, Moni. 1984. "Fertility Differential in Kerala and West Bengal: Equity-Fertility Hypothesis as Explanation." *Economic and Political Weekly* 19:33-41.
- Nair, G. S. 1968. *Effects of Marumakkathayam on the Fertility Pattern of Women in Kerala, Part 2*. Trivandrum, India: Demographic Research Centre, Bureau of Economics and Statistics.
- Negaw, John. 1936. *Public Health Practice in British India*.
- Ness, Gayl D. 1977. "Politics and Population Growth." *Populi* 4(3):1-36.
- Ness, Gayl D. and Hirofumi Ando. 1984. *The Land Is Shrinking. Population Planning in Asia*. Baltimore: Johns Hopkins University Press.
- Omran, Abdel R. 1971. *The Health Theme in Family Planning*. Monograph no. 16. Chapel Hill: Carolina Population Center, The University of North Carolina at Chapel Hill.
- Operations Research Group (ORG). 1971. *Family Planning Practices in India: First All India Survey Report*. Baroda, India: Operations Research Group.
- Operations Research Group (ORG). 1983. *Family Planning Practices in India: Second All India Survey*. Baroda, India: Operations Research Group.
- Operations Research Group (ORG). 1990. *Family Planning Practices in India: Third All India Survey*. Baroda, India: Operations Research Group.
- Organski, A.F.K., et al. 1984. *"Births, Deaths and Taxes."* University of Chicago Press.
- Pai Panandiker, V. A. and P. N. Chaudhuri. 1983. *Demographic Transition in Goa and Its Policy Implications*. New Delhi: Uppal Publishing House.
- Parsuraman, S. 1987. "SRS Age-Specific Death Rate for 1984." Mimeo. Bombay: International Institute for Population Sciences.
- Pathak, K. B. and Faujdar Ram. 1992. "Application of Bongaarts' Model for the Appraisal of Family Planning Programme Impact on Recent Fertility in India." In *Dynamics of Population and Family Welfare, 1991*, edited by Krishnamurthy Srinivasan and K. B. Pathak. Bombay: Himalaya Publishing House, 279-93.

- Potter, Robert G., Jr. et al. 1965. "A Fertility Differential in Eleven Punjab Villages." *Milbank Memorial Fund Quarterly* 43(2):191.
- Raina, B. L. 1967. "The Indian Family and Fertility." *Journal of Family Welfare* 13(3):47-50.
- Raina, B. L. 1988. *Population Policy*. Delhi: B. R. Publishing Corp.
- Raj, K. N. 1975. "Land Reforms and Their Effects on Distribution of Income." In Poverty, Unemployment and Development Policy: A Case Study of Selected Issues with Reference to Kerala. ST/ESA/29. New York: Department of Economic and Social Affairs, United Nations, p. 56-61.
- Ranganathan, K. V., Krishnamurthy Srinivasan, and Betty Mathews. 1964. *Role of Community Leaders in Promoting Family Planning*. Action Research Monograph. Gandhigram, India: The Institute of Rural Health and Family Planning.
- Rao, Sethuramiah Lakshminarayana. N. 1967. *Differential Fertility in India by State*. Bombay: International Institute for Population Studies.
- Ratcliffe, J. W. 1978. Social Justice and the Demographic Transition: Lessons From India's Kerala State. *International Journal of Health Services* 8(1):123-144.
- Rele, Jawahar Raghunath. 1962. "Some Aspects of Family and Fertility in India." *Population Studies* 15(3):267-78.
- Rele, Jawahar Raghunath. 1967. *Fertility Analysis through Extension of Stable Population Concepts*. Population Monograph Series no. 2. Berkeley: Institute of International Studies, University of California.
- Repetto, Robert C. 1979. *Economic Equality and Fertility in Developing Countries*. Resources for the Future. Baltimore, MD: Johns Hopkins University Press.
- Romaniuk, Anatole. 1978. "Evidence of Increase in Natural Fertility during the Early Stages of Modernization: Two Case Studies." Paper presented at the annual meeting of the Population Association of America, Atlanta, 13-15 April.
- Ross, John A., W. Parker Mauldin, Steven R. Green and E. Romana Cooke. 1992. *Family Planning and Child Survival Programs: As Assessed in 1991*. New York: The Population Council.
- Ross, John A., Marjorie Rich, Janet P. Molzan, and Michael Pensak. 1988. *Family Planning and Child Survival: 100 Developing Countries*. New York: Center for Population and Family Health, Columbia University.
- Rouyer, Alwyn R. 1987 "Political Capacity and Decline of Fertility in India," *American Political Science Review*, Vol. 81, No. 2, June 1987, p. 453-470.
- Roy, Turun K., G. Rama Rao, and Rajiva Prasad. 1991. "Education, Fertility and Contraception among Hindus and Roman Catholics in Goa." *Journal of Biosocial Science* 23:353-358.
- Roy, Turun K., G. Rama Rao, and Rajiva Prasad. 1985. "Recent Demographic Trends in Goa, Daman and Diu." *Dynamics of Population and Family Welfare, 1986*, edited by Krishnamurthy Srinivasan and S. Mukerji. Bombay: Himalaya Publishing House, 377-397.
- Satia, J. K. and Shireen J. Jejeebhoy. 1991. *The Demographic Challenge: A Study of Four Large Indian States*. Bombay: Oxford University Press.

- Simmons, Ruth S., Gayl D. Ness, and George B. Simmons. 1983. "On the Institutional Analysis of Population Programs." *Population and Development Review* 9:457-74.
- Sinha, U. P. [Revised for deceased Agarwala, S. N. 1987.] *India's Population Problems*. 3rd ed. New Delhi: Tata McGraw-Hill.
- Srikantan, Kodaganallur Sivaswamy. 1977. *The Family Planning Program in the Socio-Economic Context*. New York: The Population Council.
- Srikantan, Kodaganallur Sivaswamy and K. Balasubramanian. 1989. "Stalling of Fertility Decline in India." *Population Transition in India*, Vol. 1, edited by S. N. Singh, M. K. Premi, P. S. Bhatia, and Ashish Bose. Delhi: B. R. Publishing, 75-88.
- Srinivasan, K.N. 1986. "The Scheme of Medical Certification of Cause of Death Under the Aegis of Registration of Births and Deaths Act 1969 - An Appraisal." *Report of the Workshop on Statistics of Cause of Death*. 12-13 May. New Delhi: Office of the Registrar General, 61-79.
- Srinivasan, Krishnamurthy. 1980. "Birth Interval Analysis in Fertility Surveys." *World Fertility Survey Scientific Reports* no. 7. London.
- Srinivasan, Krishnamurthy. 1987. "Forty Years of Experience with Population Policies and Programmes." Manuscript prepared for the Centenary Volume of Prime Minister Jawaharlal Nehru to be published by the Government of India. Bombay: International Institute for Population Sciences.
- Srinivasan, Krishnamurthy. 1988a. "A Demographic Enquiry into Trends and Prospects of Higher Education in India and Major States." In *Dynamics of Population and Family Welfare eX*, edited by Krishnamurthy Srinivasan and S. Mukerji. Bombay: Himalaya Publishing House,
- Srinivasan, Krishnamurthy. 1988b. "Modernization, Contraception and Fertility Change in India." *International Family Planning Perspectives* 14:94-102.
- Srinivasan, Krishnamurthy. 1988c. "Regional Variations and Associated Factors in Indian Fertility." Bombay: International Institute for Population Sciences.
- Srinivasan, Krishnamurthy. 1989. "Natural Fertility and Nuptiality Patterns in India: Historical Levels and Recent Changes." *Population Transition in India*, edited by S. N. Singh, M. K. Premi, P. S. Bhatia, and Ashish Bose. Delhi: B. R. Publishing, vol. 1, 173-192.
- Srinivasan, Krishnamurthy. 1990. "An Appraisal of Critical Issues in the Indian Family Planning Programme." Bombay: [International Institute for Population Sciences.]
- Srinivasan, Krishnamurthy. 1991. "Demographic Scenario Revealed by the 1991 Census." *Journal of Family Welfare* 37(3).
- Srinivasan, Krishnamurthy. 1992. "Demographic and Epidemiological Transition in India." Paper prepared at the request of the World Health Organization and presented at the Symposium on Health Transition in India organized by WHO and the All-India Institute of Medical Science, New Delhi, 19-21 January.
- Srinivasan, Krishnamurthy and Moyer W. Freymann. 1990. "Need for a Reorientation of Family Planning Programme Strategies in Developing Countries: A Case for Birth-Based Approach." In *Dynamics of Population and Family Welfare 1989*, edited by Krishnamurthy Srinivasan and K. B. Pathak. Bombay: Himalaya Publishing House, 3-22.

- Srinivasan, Krishnamurthy and Shireen J. Jejeebhoy. 1981. "Changes in Natural Fertility in India, 1959-1972." *Dynamics of Population and Family Welfare*, edited by Krishnamurthy Srinivasan and S. Mukerji. Bombay: Himalaya Publishing House, 91-117.
- Srinivasan, Krishnamurthy and Tara Kanitkar. 1984. "The Contrasting Demography of Bihar and Rajasthan: Findings from Recent Sample Surveys." In *India's Demography: Essays on the Contemporary Population*, edited by Tim P. Dyson and Nigel R. Crook. New Delhi: South Asian Publishers, 73-91.
- Srinivasan, Krishnamurthy and Tara Kanitkar. c.1988. "Demographic Consequences of Low Status of Women in Indian Society." Bombay: International Institute for Population Sciences.
- Srinivasan, Krishnamurthy and S. Parasuraman. 1991. *Population Projections of India and the States: Revisions based on the 1991 Census Results*. Bombay: I.I.P.S.
- Srinivasan, Krishnamurthy and K. B. Pathak. 1981. "The Nature of Stable High Fertility and the Determinants of Its Destabilization: Process in Selected Countries of Asia." *International Population Conference. Manila, 1981. Solicited Papers*. Liège, Belgium: International Union for the Scientific Study of Population, vol. 1, 115-136.
- Srinivasan, Krishnamurthy, Shireen J. Jejeebhoy, Richard A. Easterlin, and Eileen M. Crimmins. 1984. "Factors Affecting Fertility Control in India: A Cross Sectional Study." *Population and Development Review* 10:273-96.
- Srinivasan, Krishnamurthy, P. H. Reddy, and K. N. Murthy Raju. 1978. "From One Generation to the Next: Changes in Fertility, Family Size Preferences, and Family Planning in an Indian State between 1951 and 1975." *Studies in Family Planning* 9:258-71.
- Srinivasan, Krishnamurthy, P. C. Saxena, Tarun K. Roy, and Ravi K. Verma. 1991. "Effect of Family Planning Program Components on Contraceptive Acceptance in Four Indian States." *International Family Planning Perspectives* 17:14-24.
- Srinivasan, Krishnamurthy, Sumati Kulkarni, and S. Parasuraman. 1991. "Impact of Alternative Growth Trends of Population on Selected Social and Economic Sectors in India." Originally published as "Impact of Population on Selected Social and Economic Sectors" in *Economic and Political Weekly* 23:1913-17; 1965-75 Sept. 10 and Sept. 17, 1988 and revised and updated in February 1991.
- UNICEF. 1988. *The State of the World's Children*. New York.
- United Nations. 1978. *Manual IX: The Methodology of Measuring the Impact of Family Planning Programmes on Fertility*. ST/ESA/SER.A/66. New York.
- UNDESA. See United Nations. Department of Economic and Social Affairs
- United Nations. Department of Economic and Social Affairs. 1961. *The Mysore Population Study; Report of a Field Survey Carried Out in Selected Areas of Mysore State, India*. Population Studies no. 34. ST/SOA/SER.A/34. New York, p. 84.
- United Nations. Department of Economic and Social Affairs. 1964. *1963 Demographic Yearbook*. 15th issue. New York.
- United Nations. Department of Economic and Social Affairs. Statistical Office. 1984. *1982 Demographic Yearbook*. 34th issue. ST/ESA/STAT/SER.R/12. New York.

- United Nations. Department of Economic and Social Affairs. 1991. *1989 Demographic Yearbook*. 41st issue. ST/ESA/STAT/SER.R/19. New York.
- United Nations. Department of Economic and Social Affairs. 1992. *1990 Demographic Yearbook*. 42nd issue. ST/ESA/STAT/SER.R/20. New York.
- United Nations. Economic and Social Commission for Asia and the Pacific. 1982. *Population of India*. Country Monograph Series no. 10. ST/ESCAP/220. Bangkok.
- Unnithan, Thottaman Kantan Kesavan Narayanan. 1956. *Gandhi and Free India, A Socioeconomic Study*. Groningen, The Netherlands: J. B. Walters, p. 75.
- Varma, Ravi K., Asha A. Blande, and Prakash Fulpagare. 1989. "Role of Incentives in the Decision-Making Process: A Study of Sterilization Acceptors in Madhya Pradesh." In *Dynamics of Population and Family Welfare*, edited by Krishnamurthy Srinivasan and K. B. Pathak. Bombay: Himalaya Publishing House, 52-67.
- Visaria, Pravinchandra Meghji. 1967. *Mortality and Fertility in India, 1951-1961*. Bombay: Department of Economics, University of Bombay; and Princeton, NJ: Office of Population Research, Princeton University.
- World Bank. 1984. *World Development Report 1984*. New York: Oxford University Press for the World Bank.
- World Bank. 1988. *World Development Report 1988*. New York: Oxford University Press for the World Bank.
- World Bank. 1990. *World Development Report 1990*. New York: Oxford University Press for the World Bank.
- World Bank. 1991. *World Development Report 1991*. New York: Oxford University Press for the World Bank.
- World Bank. 1992. *World Development Report 1992*. New York: Oxford University Press for the World Bank.
- Yeats, M.W. 1931. "Census of India, 1931, xiv, Madras, Part I Report." Superintendent of Census Operations, Madras. p. 46.
- Zachariah, Kunniparampil Curien. 1984. *The Anomaly of the Fertility Decline in India's Kerala State: A Field Investigation*. Washington, DC: The World Bank, p.1-58.