THE IMPACT OF SOCIO-ECONOMIC AND DEMOGRAPHIC VARIABLES ON FERTILITY BEHAVIOUR IN ASSAM

AN ECONOMETRIC APPROACH

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By

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It is certified that the research work in the thesis entitled "**The Impact of Socio-Economic and Demographic Variables on Fertility Behaviour in Assam: An Econometric Approach**" submitted by Sri Prabin Kalita, for the award of Doctor of Philosophy degree under Tezpur University is based upon his work under the joint supervision of Dr. Munindra Borah, Department of Mathematical Sciences, Tezpur University and Professor Haren Choudhury, Department of Statistics, Gauhati University. Neither this thesis nor any part of it has been submitted to any other university or institution for any research degree/diploma.

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Preface

Human fertility is a complex process, which is affected by several socio-economic, cultural and biological variables Economic development tends to change the demographic situation of a country by first initiating a decline in mortality and later in the reduction in fertility rates Some important factors influencing fertility transition in most of the advanced societies in the past were declining mortality, rising standard of living and the increasing cost of childbearing, educational development, occupational shifts along with industrialization and urbanization Industrialization will lead to more urbanization and thereby will again induce people to adopt birth control methods When the process of development reaches an advanced stage it may tend to reduce the birth rate and raise the rate of economic growth, thereby leading to a high standard of living Improved standard of living consequenced by the progress of society and civilization motivates people to reduce fertility out of their concern to maintain living standards

The study of population focuses attention on the size, structure, distribution and growth of population and how these factors affect and, in turn, are affected by social, cultural, economic and other variables The present study examines the fertility behaviour of currently married women of reproductive age in Assam, with particular focus on the extent to which economic, socio-cultural and demographic factors exert independent influence on fertility

The data for the study have been collected from questionnaires of National Family Health Survey, 1992-93 conducted by Population Research Center, Gauhati University, in collaboration with International Institute for Population Sciences, Mumbai The study covers a total of 1688 currently married women in the age group 15-49 years from 15 districts of Assam

In its post independence period, Assam has been able to achieve considerable progress in the production and distribution of economic wealth, but the fruits of development could not be realized because of the rapid growth of population The influence of religion extends to the very core of social behaviour, attitudes and values Religion affects not only reproductive behaviour but behaviour in other socio-economic factors as well The fertility and contraceptive behaviour are conditioned by interplay of different economic, demographic and socio-cultural variables These are considered as some of the basic factors contributing towards the uprisings among different religions for preserving socio-cultural and political identities This had stimulated interest for undertaking the present study From literature survey, it is noticed that religion differences in fertility behaviour have become important and much more concern to policy makers, programme planners in Assam In this investigation, attempt has been made to study the differences in fertility and contraceptive behaviour between two major religions (Hindu and Muslim) and to assess the impacts of the explanatory variables using various statistical devices including techniques of logit and path analysis

The thesis consists of seven chapters Different chapters of the thesis dealing with the studies, provides statistical techniques applied for the analysis The first chapter deals with the growth of population of Assam with respect to India The second chapter discusses the interrelationships of some selected socio-economic and demographic variables with fertility The third chapter attempts to quantify the intensity of a set of economic, socio-cultural and demographic variables in terms of probability of demand for additional children Chapter four attempts to study the effect of family size desire, sex preference, child loss experience and some selected socio-economic factors on ever use of contraceptive method In the field of fertility behaviour study, an initial conceptual model is necessary to take into account the numerous variables that affect fertility So, in

the fifth chapter, a technique of structural equation modelling has been developed to explain the effects of some selected socio-economic and demographic factors on fertility Chapter six relates to a multiple linear regression analysis of fertility with respect to certain aspects of female status, survival status and use of contraception by reproductive age groups of women And finally, conclusions and discussions have been drawn in chapter-seven based on available data used in the study Policy implication in the light of the state of Assam has also been discussed in this chapter

It is believed that the thesis will provide useful information to the policy makers in initiating policies to control the growth of population of Assam I am quite conscious of the probable shortcomings in establishing the complex relationships involving human behaviour on the basis of empirical findings To conclude, I owe responsibility for the errors and omissions in my investigation

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(Prabin Kalita)

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LIST OF RESEARCH PAPERS INCLUDED IN THE THESIS

(i) Already Published

- *"A Conceptual model of Fertility Behaviour"* Proceedings of the National Conference on Mathematical and Computational Models, December 27-28, 2001. PSG College of Technology, Coimbatore, India.

(ii) Accepted for publication

- *"An Econometric Study of Socio-Demographic Variables on Fertility Behaviour in Assam"* Demography India, Journal of the Indian Association for the Study of Population, IIPS, Mumbai.

- *"Son Preference and its influence on additional desired Fertility"* Indian Journal of Regional Science, Regional Science Association, Kolkata, India.

- *"Factors affecting the use of Contraception"* Journal of Assam Statistical Review, Dibrugarh University, Dibrugrah, Assam.

- *"A Path model of Fertility Behaviour"* Proceedings of the 'North Eastern Regional Workshop on Emerging Issuses on Population and Health Towards Achieving National Population Policy 2000 Goal' organized by the Department of Statistics, Gauhati University, Guwahati, November 26-28, 2001.

- *"An Econometric Study of Some Selected Socio-Demographic Variables on fertility by age group"* Man in India, Journal, Ranchi, India.

Chapter-1

INTRODUCTION

Theoretical development on population growth, structure and composition seem to have been inspired all through history by the underlying demographic situation as well as the changing socio-economic structure As and when empiricists brought forth additional dimensions, either the earlier theories were reformulated or newer ones enunciated In the process we find theoretician and empiricists from disciplines trying to synthesize the inter-relationships between demographic, economic and socio-cultural attributes This study analyses fertility behaviour and tests several relevant socio-demographic hypotheses based on National Family Health Survey data in respect of the state of Assam in India Such demographic surveys have been used in the past to identify a large number of isolated hypotheses of fertility adjustments to changing socio-economic, cultural and environmental scenarios Secondly, the conventional approach to analyze such survey data using simpler methods of tabulation or graphs does not generally guarantee the statistical validity of any underlying behavioural postulates On the contrary, it may lead to erroneous conclusions Therefore, statistical analysis, econometric estimation and inference are as important as the formulation of hypotheses or models This study, therefore, relies on rigorous statistical scrutiny, testing and analysis of the data, followed by econometric models of fertility behaviour An econometric approach is preferred here in order to (i) formulate a conceptual model and (ii) systematically deduce a consistent set of hypotheses Such an integrated approach, starting from the formulation of a behavioural model and the testing of different fertility related variables using econometric methods, may lead to the characterization of a realistic fertility behaviour and a set of meaningful policy packages

1.1 Background of the Present Study Area

The state of Assam is in the northeast corner of India and is connected with the rest of India by a narrow strip of land lying in the sub-mountainous regions of the Himalayas The present boundary of the state of Assam is lying between 24^0 to 28^0 North latitudes and 84^0 40′ to 96^0 East longitudes [Borooah, (1985)] It is bounded in the north by the neighbouring country of Bhutan and the Indian state of Arunachal Pradesh, in the east by the states of Arunachal Pradesh, Nagaland and Manipur, in the south by Bangladesh and states of Mizoram, Tripura and Meghalaya, and in the west by Bangladesh and the state of West Bengal The state of Assam, which was reconstituted after the 1971 Census, is a miniature form of the ancient Assam The ancient Assam was known as Pragjyotisha in the Mahabharata and as Kamrupa in the Puranas and the Tantras [Gait (1926)] The total area of Assam is 78,438 Sq Kms, which accounts for about 2 4 percent of the country's total land area So far as area and population are concerned, Assam ranks fourteenth and thirteenth respectively among all the states of India The state is divided into two distinct physical divisions, viz , the Brahmaputra valley comprising eighteen districts of plain areas and two districts of hill areas with a total area of 71,516 Sq Kms and the Barak valley comprising three districts with plain areas of 6,922 Sq Kms For administrative and revenue purpose the 23 districts of the state are divided into 48 sub-divisions and 149 revenue circles The state's climate is a humid tropical type in the plains and sub-alpine in the hills Generally there are four distinct seasons in a year spring during March-April, summer during May-August, autumn during September- November and winter during December-February

1.1.1 Growth of Population

Population of Assam is composed of heterogeneous elements There are a number of tribes professing different rituals and beliefs and speaking different languages and dialects The decennial growth rate of the population of Assam has always turned out to be higher than that of the country as a whole

Table-1 1 Decadal Population growth of Assam and India, 1901-2001

Census Population (in million)			Decadal population growth (in percent)	
Years	India	Assam	India	Assam
1901	238 4	3 29	-	-
1911	252 1	3 84	5 75	16 99
1921	251 3	4 63	- 0 31	20 48
1931	279 0	5 56	11 0	19 91
1941	318 7	6 69	14 22	20 40
1951	361 1	8 03	13 31	19 93
1961	439 2	10 83	21 51	34 98
1971	548 2	14 63	24 80	34 95
1981*	683 3	18 04	24 66	23 40
1991	843 4	22 41	23 50	24 20
2001	1027 0	26 63	21 34	18 80

* Includes Projected Population of Assam

Source

1 Family Welfare Population Year Book 1987-88, Ministry of Health & Family Welfare Govt of India, New Delhi
2 Census of India, 1991, Series-I, Paper-I of 1992, Final Population Totals, Registrar General & Census Commissioner, India, New Delhi
3 Census of India, 2001, Provisional Population Totals, Registrar General & Census Commissioner, India, New Delhi

Comparing the rate of population growth in Assam with that of India as a whole from 1901 to 1921 (Table-1 1), it is found that rate of increase of population in all India was very slow- only 129 lakhs or less than 6 percent against an increase of 33 to 46 lakhs, an increase of more than 39 percent in the population of Assam Since 1921 there has been a much more rapid rise of population of India as a

whole, and of Assam in particular From 1921 to 1951 the population of India increased by 44 percent, and the population of Assam by 73 percent During the fifty years from 1901-51 the population of Assam has increased by 144 percent against an increase of 51 percent for India as a whole Excepting the state of Kerala where the population has increased by nearly 150 percent since 1901 to 1951, Assam shows the highest growth rate amongst the states of India The trend of population growth of Assam is not similar to the trend of the whole country The increase of population in Assam during 1901 to 1921 period is very striking A stable pattern of population growth has been observed in the thirty-year period (1921-51), while the increase in the population during 1951-1971 could well be called explosive Another important aspect of the population growth of Assam in recent past has been the differentials in the growth rates, especially between pre and post period of 1951 The population of Assam during the period 1951-2001 has registered a rapid growth of nearly 6 times that of the period 1901-51 During the period 1971-2001 the population growth rate in Assam has registered a decline by 16 points (from 34 95 percent to 18 8 percent) against only a decline of 3 5 points for the country as a whole Fig -1 1 also show that the year 1951 can be considered as the year of the "big divide" because during the 50 years prior to it (between 1901-1951), Assam's population increased by 4 19 million, or at an average rate of 0 08 million per year But after 1951, Assam's population increased significantly, roughly by 11, 15, 18, 22 and 27 million during the 1951-61, 1961-71, 1971-81, 1981-91 and 1991-2001 decades respectively Between 1901-2001 the population of Assam increased by 8 times against 4 times for the whole country The increasing pressure of population on land in Assam can also be observed from its density of population Here the average density of population per square kilometer works out to 286 in 1991 and 340 in 2001 as against India's average density of 267 in 1991 and 324 in 2001

Population Growth Trend of Assam and India, 1901-2001

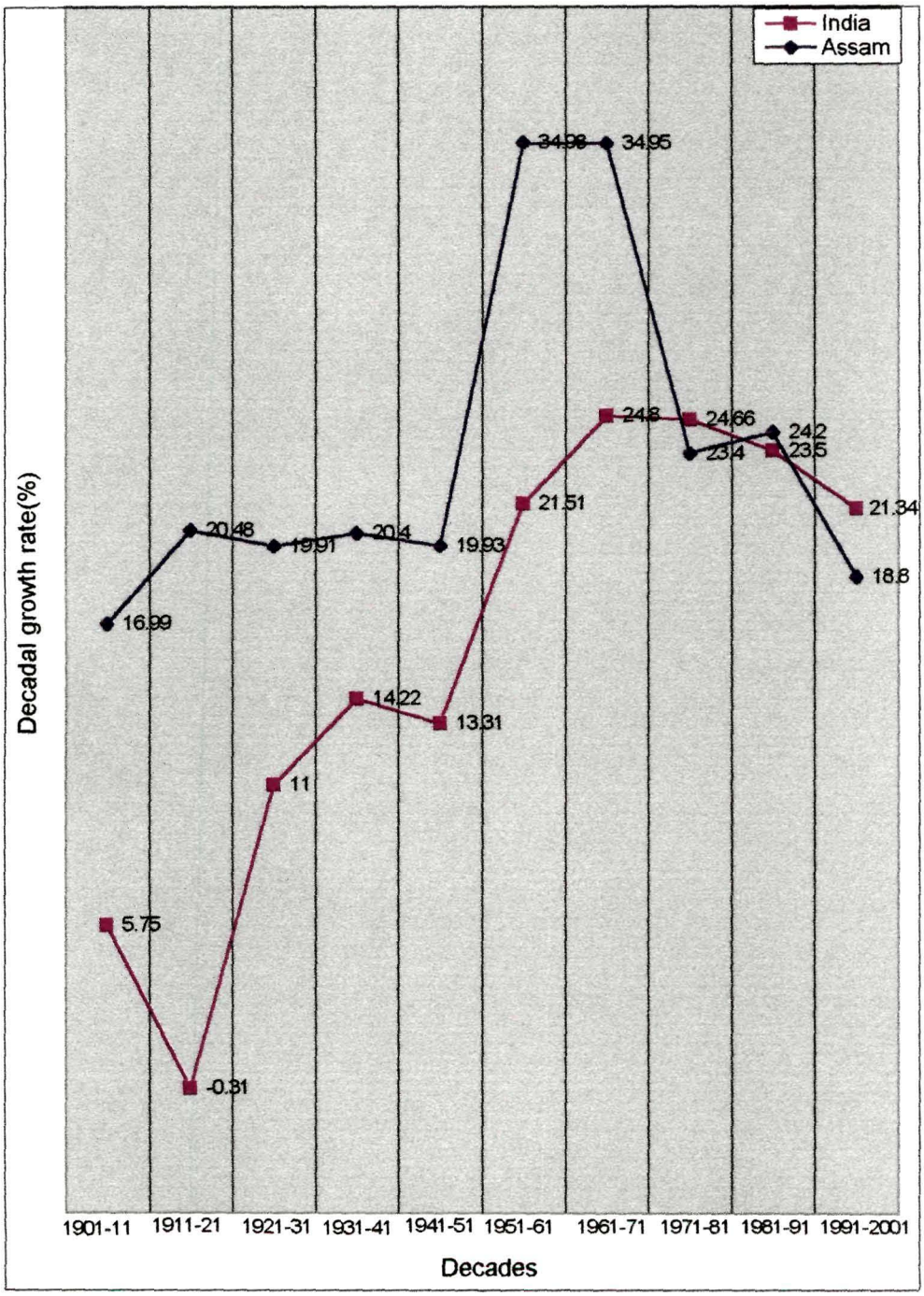


Fig.-1.1

India's population, which was 342 million in 1947, was recorded to have crossed the staggering figure of 1027 million by the year 2001 The population of the country is increasing by about 15+ million every year The population growth rate in India can be subdivided into three distinct periods (a) prior to 1921, (b) 1921 to 1951 and (c) from 1951 to present The first twenty years (1901-21) witnessed a net addition of only 5 4 percent population The next thirty years saw an increase in the population by 43 7 percent In the following four decades (1951-91), India experienced an explosive population growth of 133 72 percent In the hundred years 1901-2001, India's population increased by 230 7 percent (Table-1 1) Due to the difference between the growth pattern prior to and after 1921 (Fig -1 1) in India, the census commissioner of 1951 called 1921 as the year of the "Great Divide" The thirty-year period (1921-51) saw rapid population growth, while the increase in the population after 1951 could well be called explosive

1.1.2 Birth and Death rate

The demographic characteristics of the underdeveloped countries include high fertility and low or rapidly declining mortality These two factors have led to an accelerated population growth [Misra (1995)] Population can increase by excess of births over deaths or by net immigration A part of the decline in the levels of birth rate is attributed to the rapid decline in mortality resulting in a change in the structure which is favourable to low birth rate Population growth of India prior to 1921 was almost stationary- both birth and death rates were high and the increase was largely controlled by fluctuating mortality The growth of population of India after 1921 is explained by the decline in mortality, control of wars, famines and epidemics as well as efficient methods of production and distribution of food grains The rapid rise in population of India after 1951 is mainly due to a reduction in mortality and a more or less stable rate among its larger population The level of birth rate in India was high but is slowly declining (Fig -1 2(b))

Death rate (per thousand) of Assam and India, 1991-99

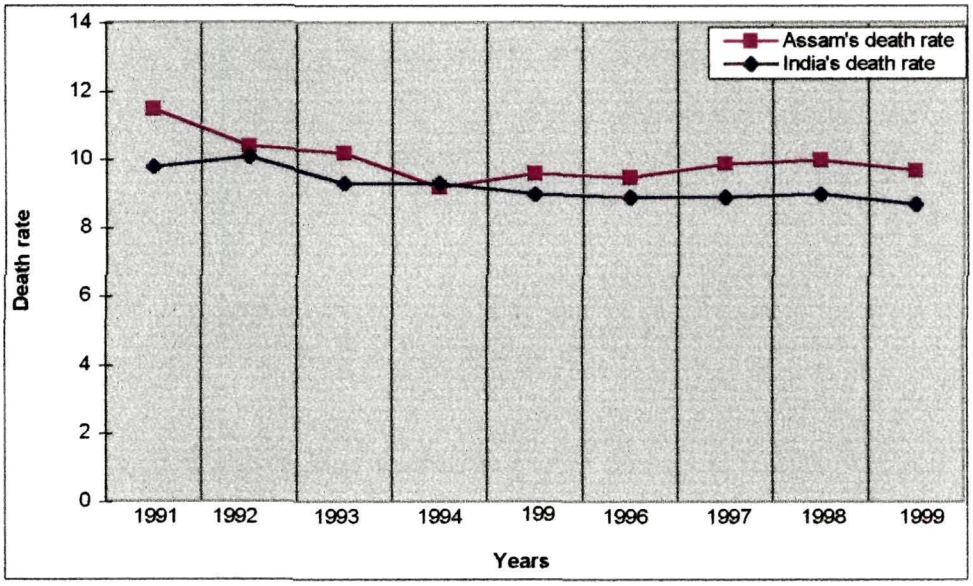


Fig.-1.2 (a)

Birth rate (per thousand) of Assam and India, 1991-99

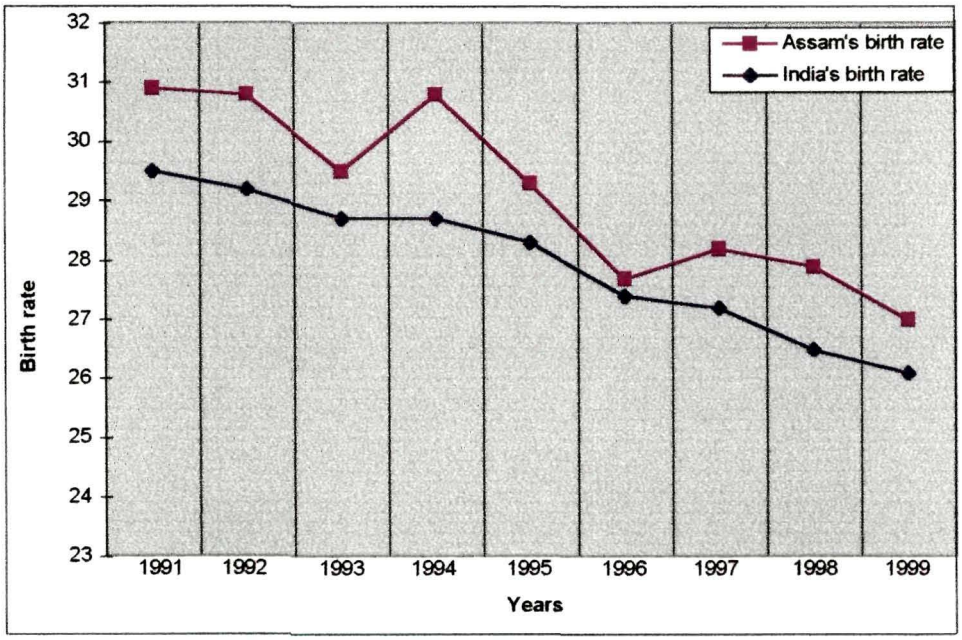


Fig.-1.2(b)

Source: Sample Registration Bulletin, R.G.I., New Delhi, October 2000.

According to this source, in most of the years from 1991 to 1999 both birth and death rates were found to be higher in the state than that of the country as a whole From the trend of birth and death rates (Fig -1 2(a) and Fig -1 2(b)) of Assam over the years, one may surmise that death rates have gradually declined due to the improvement of public health measures, but birth rates have not changed significantly According to estimates derived from Sample Registration System (SRS) in 1992, Assam's crude birth rate was 31 3 which was slightly higher than the all-India birth rate of 29 0 However, Assam's death rate was the same as that of entire India around 10 per 1,000 The total fertility rate of 3 5 children per woman for the state was also very similar to India's rate of 3 6 as estimated by the SRS in 1991

1.1.2 In-migration

As stated earlier, Assam has experienced high rate of population growth since post independence era The latest figures indicate that from 32 90 lakhs in 1901, the population in Assam has increased to 266 3 lakhs in 2001 or by about 709 4 percent within the 100 years period from 1901 to 2001 During this period India as a whole has experienced growth of population by 330 7 percent Such growth rate of Assam in post independence period cannot be from the natural growth rate (i e of excess of birth over death rates) of increases as there is no reason for significantly higher natural growth rate of population of Assam After the partition of the country there has been a large influx of Hindu refugees from East Bengal (now Bangladesh) who settled down in areas near urban centres or in rural areas where they have some relation or linguistic affinity The influx of the Muslim farm settlers from Bangladesh to the Govt waste land, forest land and chars (river island) became slow after the partition, but it again began in post 1951 period (particularly after 1971 Bangladesh war) In addition to these

influxes, a large number of people from other parts of India have also come to North East India (particularly to Assam) after independence for trade, business, industry, profession, etc From the natural rate of growth of population in all-India (and also Assam), it has been estimated that about 20 to 25 lakhs of persons have come to Assam since 1951 to 1971 from outside the state Another 15 to 20 lakhs of people from outside the state is estimated to have come to Assam after 1971[Goswami (1994)] Abrupt decline in the growth rate of Assam's population during the decade 1971-81 to 23 40 percent, during the decade 1991-2001 to 18 80 percent seems somewhat surprising These data on growth rate of population indicate that after 1971 the natural growth rate (mainly excess of births over deaths) has declined considerably and that inflow of persons from outside to Assam has also stopped or has been insignificant

1.1.4 Sex Ratio

The trend of sex ratio of Assam is not similar to that of the whole country The sex ratio (the number of females per thousand males) of Assam shows almost a declining trend in the sixty-year period (1901-61), while an upward trend is visible since 1960's (Fig -1 3) This is partly due to higher mortality among female children and sizeable maternal mortality This emphasizes the fact that Assam has not yet entered modern industrial age with its complementary characteristics of increasing risk of male lives and reduced risk of female lives In India, the sex ratio has been gradually declining from 972 in 1901 to 933 in 2001 (Fig -1 3)

Trend of sex ratio of Assam and India, 1901-2001

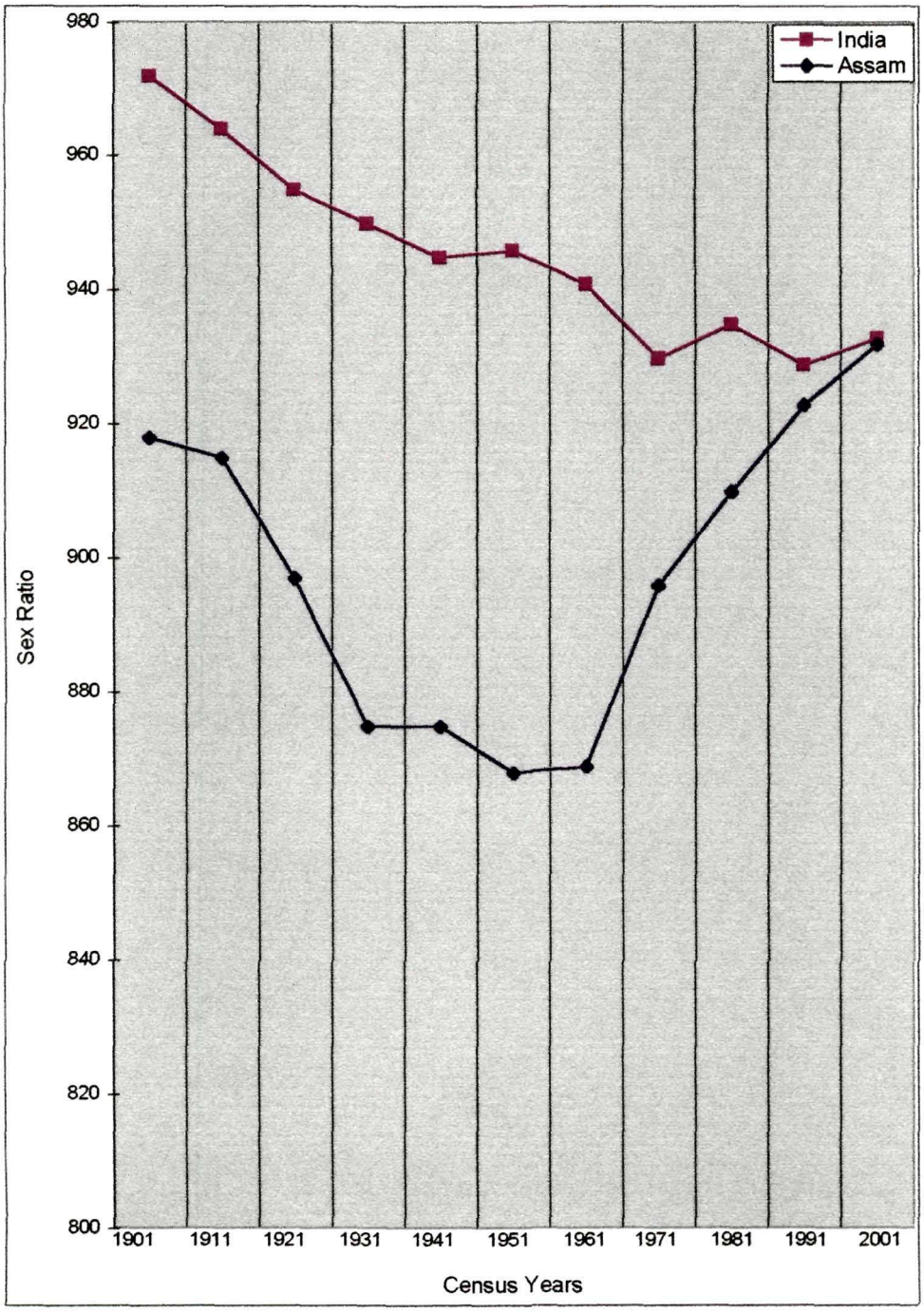


Fig.-1.3

1.1.5 Socio-Economic Development

The pattern of fertility may vary with the changing socio-economic structure of a society Some important factors influencing fertility transition in most of the advanced societies in the past were declining mortality, rising standard of living and the increasing cost of child-bearing, educational development, occupational shifts along with industrialization and urbanization, and so on Malthus (1966) argued that the balance between population and production is maintained through checks on components of population change Factors such as famine, disease and war are enunciated as positive checks monitoring the mortality component, whereas the postponement of marriage is affirmed as preventive checks monitoring the fertility component of population change On the other hand, he suggests that improved standard of living due to progress of society and civilization motivates people to reduce fertility because of the fear of decline in the living standards due to an increase in population Economic development tends to change the demographic situation of a country by first initiating a decline in mortality and later in the reduction in fertility rates [Misra (1995)]

Table-1 2 Per capita income (Rs) of Assam and India, 1993-2000

Year	At current prices		At constant (1993-94) prices	
	Assam	India	Assam	India
1993-94	5715	7698 2	5315	7698 2
1994-95	6493	8844 6	5737	8068 8
1995-96	7001	10103 0	5760	8478 9
1996-97	7394	11554 2	5793	8987 4
1997-98	8026	12729 1	5919	9271 1
1998-99	8393	14682 3*	5587	9738 7*
1999-2000	9612*	-	5968*	-

* Quick Estimate

Source (i) Directorate of Economic & Statistics, Assam, 2000
(ii) Central Statistical Organisation, Govt of India

The economic effects of population growth have centred on its impact on growth of total or per capita income So far as per capita income is concerned, it has been noticed that since long back Assam continued to lag behind in the per capita income than that in the national level In the recent few years, the gap of per capita income of Assam and India has widened further (Table-1 2) For instance, during 1998-99 the per capita income for the country as a whole was Rs 14682 3 at current prices and Rs 9738 7 at constant (1993-94) prices, while the same for Assam stands at a much lower level of Rs 8393 and Rs 5587 respectively

1.1.6 Literacy

Of all the aspects of population attributes, literacy gives the best indication about the socio-economic development of a society The trends in literacy are indicative of the pace at which a particular society is getting transformed For the underdeveloped countries, the level of education is considered to be a depressor of fertility Education enhances the quality of human capital and is indispensable for modernization In Indian census a person not able to read and write in any language was considered 'illiterate', a person able to read and write any language, 'literate' Though there has been substantial increase in the level of literacy since the beginning of the century, it is still low and there are wide variations in the level of literacy among different parts of the country Western education was introduced in Assam after Assam came under the British rule In the period 1901-31 the state's literacy showed a perceptible progress and caught up with the national level The worldwide economic depression of the early nineteen-thirties had its impact even on the growth of the state's literacy as in any other part of the country The decade 1941-51 shows a very slow rate (Table-1 3) of literacy progress

Table-1.3: Literacy rate (percentage) of Assam and India, 1901-2001.

Year	Assam	India
1901	6.2	5.35
1911	4.7	5.92
1921	6.2	7.16
1931	9.2	9.50
1941	12.6	16.1
1951	13.2	18.33
1961	21.2	28.31
1971	28.72	34.45
1981*		43.56
1991	53.42	52.11
2001	64.28	65.38

* Excludes Population of Assam

Source
(i) FWP Year Book, 1986-87, Ministry of H & FW, Govt. of India.
(ii) Provisional population Totals, Census of India-1991,2001
(iii) Borooah, G.L.: Population Geography of Assam, Mital Publication, Delhi, p. 187, 1985

Adult education programme taken up during and after the Second World War and a rapid spread of school education after 1951 contributed substantially towards the rise of literacy in the state. The independence of India in 1947 brought about some sort of a social revolution especially in the field of education. New schools and colleges began to be set up both in the urban and rural areas. Thus by 1961, the literacy rate of the state rose to 21.2 percent as against 28.31 percent in the country. In-migration of a large number of illiterate workers from outside Assam to the industrial, mining, commercial and transport establishments adversely affected the rate of growth of literacy during the decade 1961-71. After 1991, Assam's literacy rate comes nearer to that of the average literacy rate of India (Fig.-1.4).

Literacy rate (in percentages) of Assam and India, 1901-2001.

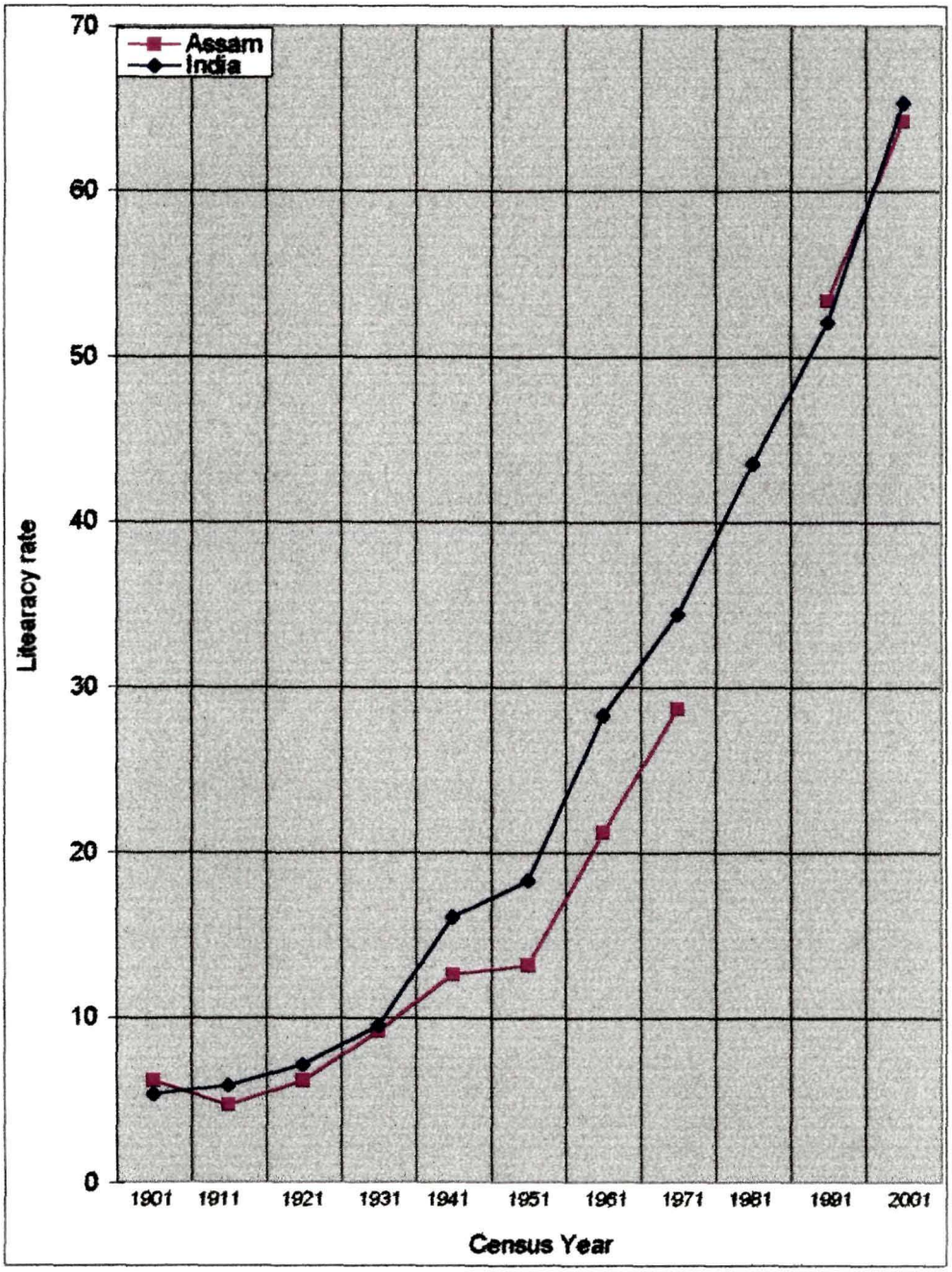


Fig.-1.4

Note: The discontinuity of the trend of Assam's literacy rate is due to nonavailibility of data for the census year 1981.

The provisional literacy rate of Assam stands at 53 42 percent (62 34 percent male literacy and 43 70 percent female literacy) in 1991 and that for the census year 2001 is 64 28 percent (71 93 percent male literacy and 56 03 percent female literacy) The provisional literacy rate of India as a whole is 52 11 percent (63 86 percent male literacy and 39 42 percent female literacy) in 1991 and that for the census year 2001 is 65 38 (75 85 percent male literacy and 54 16 percent female literacy) Thus the female literacy of Assam is higher than that of India in general But male literacy rate of Assam is lower than that of India

1.1.7 Religious Composition

According to the 1991 census, the religious composition of the state's population are- 67 13 percent Hindu, 28 43 percent Muslim, 3 32 percent Christian, 0 07 percent Sikhs, 0 29 percent Buddhists, 0 09 percent Jains and 0 67 percent belongs to other religions As compared to the 1971 census, the State's Hindu population declined by 5 37 percent whereas it increased by 3 83 percent in case of Muslim population and 0 72 percent in Christian population (Office of the Registrar General and Census Commissioner, 1975) Like in India, Hindus form a majority in Assam as well, while other religions are represented in minorities After the Hindus, the Muslims are the second largest group Christians constitute the third major religious group in the order of numerical strength The two major religions of India, Hinduism and Islam, have in their scriptures certain prescribed norms which impinge on one or all of the three components of fertility, mortality and migration

1.1.8 Population Control

Among the developing nations, India was the first country to recognize the perils of unchecked population growth and also the first country to embark on an explicit official family planning programme in 1951 India committed herself to

the gigantic task of controlling her population by bringing about a change in family size and fertility behaviour and thus family planning became an accepted public policy The family planning programme's aim to bring about a reduction in family size and thereby reduce fertility will require a tremendous change in the behaviour pattern of millions of couples The major obstacle in the success of family planning in India can be grouped into four broad categories viz (a) the value system of the people that limits motivation to adopt family planning, (b) social and demographic characteristics that adversely affect the adoption of the family planning programme, (c) administrative defects and bureaucratic problems that involve a lack of commitment on the part of family planning staff, resulting in a lack of coordination, supervision and follow-up activities and (d) a lack of suitable contraceptive technology for Indian conditions At the individual level, the reasons for non-acceptance of family planning have been many and one of these is that couples want more children because of (a) prevalence of high child mortality, (b) existence of son preference, (c) old age security, (d) additional hand in agricultural activities etc In order to strengthen research, the government of India has established 18 Population Research Centres (PRCs) located in universities and institutes of national repute throughout India The major findings of the most recent surveys are (a) awareness of family planning is widespread and over 60 percent of the people have attitudes favourable to restricting or spacing births, (b) customs and traditions play an important role in determining the age at marriage, but there is favourable upward trend in age at marriage, (c) literacy increases the acceptance of one son as ideal and is positively correlated with the increase in marriage age, (d) medical institutions in urban areas are being increasingly utilized although easy access in rural areas is lacking and under-utilization is common, and (e) apathy and concern regarding the effects of contraception on health, religious beliefs and illiteracy are some of the major obstacles in the practice of family planning In the light of these and other

findings and its own evaluation, the government set in operation a consultative mechanism to devise a revised strategy for family welfare The new strategy will include (a) raising the mean age at marriage for women over 20 years, (b) improving the status of women, (c) increasing the literacy rate, (d) provision of old age security, (e) enhancing child survival and development, (f) ensuring community participation through population committees at block levels, (g) involving voluntary organizations on a large scale, (h) motivating the cooperative sector enterprises and professional organizations to undertake family welfare programmes, (i) involving political leaders in the propagation of the family welfare message and (j) improving programmed management

When compared to the condition of India as a whole, Assam is lagging behind in terms of the acceptance of family planning Current contraceptive prevalence in Assam is moderate with 43 percent of currently married women of age 13-49 practising family planning, 20 percent using modern methods and 23 percent using traditional methods Two-thirds of the currently married women who have ever used contraception are current users [NFHS-1's Report, Assam(1995)] According to the NFHS-2 (1998-99) [NFHS-2's Report, (2000)], 49 percent currently married women have ever used a modern method and 12 percent have ever used a traditional method Ever use of any method is higher in urban areas (67 percent) than in rural areas (51 percent) Ever use of any modern method increases with women's age upto age 35-39 (peaking at 67 percent) and declines at older ages The increase in contraceptive use with age upto 35-39 reflects a life-cycle effect, with women increasingly adopting contraception as their fertility goals are met Declining ever use of modern methods by older women reflects, at least in part, larger family size norms and lower levels of contraceptive prevalence in the past The pattern of ever use by age is similar for urban and rural areas, although urban women are more likely to have used contraception than rural women at every age

Fertility has declined in India over the past 15 years, but estimates of precise fertility rates and the speed of fertility decline have varied Accurate estimates of the fertility decline are important for monitoring the progress of India's national family programme and for formulating India's five-year development plans, which are based partly on population projections Gandotra et al (1998) have noticed that fertility has tended to decline more slowly in states that currently have high fertility In the six states with comparatively high fertility (Haryana, Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar and Assam), the percentage by which current fertility is lower than cohort fertility ranges from 19 percent in Uttar Pradesh to 39 percent in Assam In the states with median fertility (Delhi, Himachal Pradesh, Jammu, Punjab, Orissa, West Bengal, Gujarat, Maharastra and Karnataka), this percentage ranges from 28 percent in Delhi to 40 percent in Orissa In the states with comparatively low fertility (Andhra Pradesh, Goa, Kerala and Tamil Nadu), the percentage tends to be larger, ranging from 36 percent in Andhra Pradesh to 49 percent in Goa They have also observed that India's fertility has declined faster among urban women, more educated women and Hindu women and non-SC/ST women A series of policies have been formulated and implemented in free India to reduce the levels of infant mortality, yet high infant mortality rate continues The problem assumes added significance in view of the fact that unless the infant mortality rate is reduced drastically, fertility and population growth cannot be reduced to a considerable extent and the liberation of women remains a distant reality Furthermore, the problem becomes complicated because of the attitude of the couples that accept birth control Generally, they resort to birth control methods after having a rather large number of children In the Indian socio-cultural background, where the life expectancy of the infants is very low, couples want to produce more and more children so that a few may survive to adulthood

1.2 Objective of the study

The study of population focuses attention on the size, structure, distribution and growth of population and how these factors affect and, in turn, are affected by social, cultural, economic and other variables The present study examines the fertility behaviour of currently married women of reproductive age in Assam, with particular focus on the extent to which economic, socio-cultural and demographic factors exert independent influence on fertility The fertility and contraceptive behaviour are conditioned by interplay of different economic, demographic and socio-cultural variables These are considered as some of the basic factors contributing towards the uprisings among different religions for preserving socio-cultural and political identities This has stimulated interest for undertaking the present study The sole objective of the present work is to study the possible sources as well as the nature and extent of variation in fertility behaviour and contraceptive behaviour between the two major religious groups Hinduism and Islam Due to the less population percentage and consequently insufficient data of religions like Christianity, Sikhism, Buddhism, Jainism and others, they are not considered in this study

Specifically, it is designed to study the inter-relation of different economic, socio-cultural and demographic variables among and between the two religions and so as to examine how

(a) the desire for future birth is affected by economic, socio-cultural and demographic variables,

(b) the contraceptive practice is affected by the socio-economic and demographic variables plus desire for future births and

(c) children ever born are affected by different socio-cultural and demographic variables

1.3 Sources of Data

The data for the study have been collected from questionnaires of National Family Health Survey,1992-93 (NFHS-1) conducted by Population Research Centre (PRC), Gauhati University, in collaboration with International Institute for Population Sciences (IIPS), Mumbai The study covers a total of 1688 currently married women in the age group 15-49 years from 15 districts (out of 23 districts) of Assam The NFHS in Assam, which was conducted during the period of December 1992-March 1993, gathered information on a representative sample of 3006 ever-married women from 3255 households In this study, the number of children ever born to each woman is used as a measure of fertility The child mortality refers to the number of children dead in the five years period immediately preceding the survey, 1988-1992

1.4 Variable Description

The accelerated pace of mortality decline without a corresponding downward shift in fertility resulted in the rapid growth of the already large Indian population from the nineteen-twenties (Table-1 1) The decline in mortality resulted because of the control of Malthusian evils (like famines, epidemics and wars) and the adoption of modern technology for death control which was universally desired Obviously, the burden of growing numbers lies in limiting fertility rather than in enhancing mortality Thus the increasing concern for restraining population growth in India led to a growing number of research studies on fertility and the spread of family planning programmes for curtailing fertility

The variables which are considered for analysis of fertility behaviour among the specified groups of people in the study are

(i) socio-cultural factors (namely formal years of schooling for both husband and wife, residential status of the respondent and standard of living index of households),

(ii) demographic factors (namely size and sex composition of surviving children, spouse's current age, female age at first marriage, children ever born and child mortality),

(iii) economic factor (namely husband's occupation),

(iv) desire for additional children and

(v) contraceptive practice

Description of the variables as considered and used in the present study are as follows

1.4.1 Children ever born

Fertility is measured by the number of children ever born to a couple by the end of reproductive span, i e when the family size is completed. The variable children ever born (CEB) are considered in terms of single number of children ever born in the birth history of a wife This variable represents the fertility levels of couples which are adjusted to the deaths of children in the past, and the expected risk of the same Other definitions of fertility such as number of pregnancies etc have been avoided as they require additional data on miscarriages etc These data were not available and hence this aspect is ignored

1.4.2 Education

Studies analyzing fertility differentials by educational status generally reveal a negative association between fertility and education Population segments having higher educational achievements generally depict lower fertility Empirical findings in the studies by Driver's (1963) survey of Nagpur and Hussian's (1970) study of Lucknow city depict the negative association between fertility and education It is generally observed that educational attainment is highly correlated

with socio-economic development Educational attainments of persons open up avenues for them to raise their social status, encourage them in non-familial activities and expose them to various communication media Thus education has been considered to be the single most important variable motivating people to have smaller families Presumably it also affects fertility through intermediary demographic variables (like higher age at marriage and greater knowledge of contraception) In this context, couple's educational level is considered by measuring the husband's formal years of schooling (HYS) and also the wife's formal years of schooling (WYS)

1.4.3 Age at marriage

It is often felt that the enhancement of age at marriage leads to a reduction in fertility The inverse association between the two has been depicted in various studies, namely, Agarwala (1966, 1989) and Goyal (1974) In particular, raising the age at marriage for women beyond 20 years has been viewed to cause a reduction in fertility of about 15-30 percent by Agarwala (1966) Das (1969) claimed, on the basis of an empirical study, that women marrying between 20 and 24 years have similar fertility to those marrying before the age of 20 However, with a marriage age of 25 years and above, there seems to be a different effect on fertility So prevalence of early and universal marriage of women is of great demographic, social and economic significance The postponement of marriage contributes substantially towards a reduction in the level of fertility by shortening the total reproductive span of the female, which in turn contributes to a cumulative effect and influences the size of individual families as well as the population growth rate of a country The variable female age at first marriage (FAM) is measured in terms of single years completed by the wife at the time of her first marriage

1.4.4 Economic variable

Easterlin (1969) emphasized the influence of taste structuring during the period of nature on fertility behaviour over the reproductive span Generally, in India the parents take the important decisions regarding education of the children and their marriage Thus the socio-economic environment of the parents becomes even more important in influencing not only preferences or taste structuring during the period of nature but also respondent's education and age at marriage which, in turn, have a bearing on fertility In this context, the variable, husband's occupation (HOC), is considered as a categorical dummy variable Here '0' is considered for unemployed husbands and '1' is considered for employed husbands (including those in government and non government services or any type of industrial activity)

1.4.5 Residential background (Rural/Urban)

Almost all demographic and fertility surveys indicate that rural couples have much higher fertility than the urban couples Here the place of residence is considered as a dichotomous variable depending upon place of residence, rural or urban area The variable takes the value '0' if the respondent lives in rural areas and '1' otherwise

1.4.6 Age of Husband and Wife

It cannot be disputed that age is simply the single most important source of variation in social and demographic processes in general, and in the fertility behaviour in particular The variables, husband's current age (HCA) and wife's current age (WCA) are measured in years completed in the last birthday

1.4.7 Child mortality

Child mortality (specially infant mortality) has intensifying effects on fertility rates The direct relationship between infant mortality and birth rates has been established in many studies reviewed by Mandelbaum (1974) Chandrasekhar (1972) summarized the evidence and posited that the higher the birth rate, the higher is the infant mortality rate Apparently, lower infant mortality or reduced mortality conditions ensure couples higher probabilities for the survival of their children to maturity and would definitely motivate couples having a target number of surviving children to reduce their number of births for the same target It is a fact that unless the child mortality (specially infant mortality) is reduced drastically, fertility and population growth cannot be reduced to a considerable extent Furthermore, the problem becomes complicated because of the attitude of the couples that accept birth control Generally, they resort to birth control methods after having a rather large number of children In the Indian socio-cultural background, where the life expectancy of the infants is very low, couples want to produce more and more children so that a few may survive to adulthood In this study child mortality (CM) is measured in terms of the number of children dead, if any, to a couple in their marital life

1.4.8 Desire for additional children

The dichotomous variable, desire for additional children (DAC), is taken from the couple's response with regard to the desire for additional children In response to the question whether the couple desires any future births, if the answer is yes, the variable takes the value '1', if the answer is no, the variable takes the value '0'

1.4.9 Religion

Generally, fertility among Muslims has been observed to be higher than among Hindus in India Davis (1951) analysed the inter-censual growth rates of Hindus and Muslims and observed that Muslim communities show higher population growth than Hindus Studies by Mukherjee and Singh (1961) and Dandekar (1967) also have corroborated the finding of higher fertility among Muslims over Hindus Again, certain studies, like the Driver's (1963) study of Nagpur district have revealed these differentials among Hindu-Muslims to be negligible, while Hussain's (1970) study of Lucknow depicted higher fertility among Hindus as against Muslims Among Hindus fertility was found to be about 20 to 26 percent higher than that of Muslims However, Hussain's results on religious differentials in fertility are different from those of Mukherjee's study conducted in the same city of Lucknow, but after a span of ten years In this context a dichotomous variable is taken from the husband's religion (HRL) In response to the question whether the husband is a Hindu, the variable takes the value '1' and if he is Muslim, the variable takes the value '0'

1.4.10 Standard of living index

Standard of living index (SNLI) is considered a measure for household wealth as well as a measure for accessibility and toward modern ways of living This index as a weighted average [Ganguli and Gupta (1976)] for each unit considered in this study by taking into consideration of availability of data in their household, namely type of toilet facility, type of houses, electricity facility and facility of drinking water etc for each family as recorded in the questionnaire of NFHS-1, Assam

1.4.11 Son-Survivorship Motivation

The consistent decline in the male-female sex composition in India till 1971 (except for a slight improvement in 1981) has been largely due to sex selective mortality unfavourable to females (Census of India, 1981) Anand (1964), on the basis of survey data, found that couples stating preference in terms of an ideal or desired family size of three prefer to have two sons and one daughter Theoretically, one can argue that the motivation for having children of any sex will have a positive impact on completed fertility In this context, the variables Number of living sons (SON) and Number of living daughters (NLD) are considered in our study

1.4.12 Contraceptive Method

The population policy in India has been placing great emphasis on intensifying family planning programmes, especially in terms of wider acceptance of contraceptive methods rather than influencing fertility through social and economic perspectives Rele (1974) has noticed that the initial stage of the onset of declining fertility has been well on its way since 1966 but the next stage of rapid decline in fertility can be expected only if the programme is supported by proper inputs, as well as simultaneous social and economic development Stated differently, there seems to be a general agreement that the simple awareness and availability of family limiting methods may not effectively control fertility unless people are properly motivated to reduce fertility The variable, ever use of any contraceptive method (COM), is taken as a dichotomous variable from the couple's responses with regard to contraceptive practice In response to the question whether either or both of the husband and wife ever adopted any contraceptive method for prevention or control of child birth, if the answer is yes, the variable takes the value 1, if otherwise, the variable takes the value 0 The

term "ever use" refers to the use of a contraceptive method at any time before the date of interview without making any distinction between past use and current use Any respondent reporting that she or her spouse had ever used some form of contraception was counted as an ever user regardless of the time of use Also an ever user might have used more than one method

We assume that socio-economic (education and occupation) and demographic variables (current age, age at marriage and child mortality) affect the dependent variables' desire for additional children, contraceptive practice and children ever born Children ever born is dependent on all the above mentioned variables Each of the predictor variables affects the dependent variables either singly or simultaneously Before discussing the relationship between the predictor and dependent variables, a few points are to be noted Children ever born and desire for the background of both husband and wife affects future birth as well as contraceptive practice Hence there is a problem about whose background variables regarding educational level, occupational status, current age and age at marriage should be included Education is included in the study as predictor because of the fact that it is the level of education which reflects the general awareness about the world outside home, modernization of thought and living, approach to health care facilities, duties and responsibilities towards the society and as a determinant of the role of relationship of the females in the process of family formation and limitation Moreover, it is ultimately the wife upon whom the burden of conceiving, bearing and rearing of the children rest which, in addition to biological factors, involves psycho-social and familial aspirations of the wife Hence education of wife is likely to have stronger influence than that of the husband in the process of child birth, desire and contraceptive practice Wife's age is more important than that of the counterpart in determining the probability of conceiving Wife's age at marriage is used because it is more relevant to the length of time the wife is exposed to the risk of conception Various scholars have

studied fertility differentials by rural-urban residential status, migratory status of the household head, caste, occupational structure, and so on Nevertheless, it seems to be an impossible task to exhaust the whole set of socio-economic, cultural and psychological characteristics influencing fertility behaviour Many empirical studies attempting to highlight the importance of crucial factors affecting fertility behaviour in India, even with a partial list of variables, have often viewed that the problem of multicollinearity is quite serious and renders the task of identifying relevant factors extremely difficult Khan (1975) has clearly demonstrated that such limitations seriously affect the precision of the estimated parameters Further, empirical evidence on the determinants of fertility, either due to differential coverage of relevant characteristics or specification of the adopted models, has further complicated the issue So far it has not been possible to highlight the relative importance of different variables influencing fertility So no conclusive results and generalizations could be evolved from the existing literature on fertility in India In such a situation where a few study exists encompassing the whole complex of socio-economic, cultural and demographic factors affecting fertility behaviour, it would be of interest to examine the fertility behaviour of respondents in the state of Assam where a substantial amount of variations over socio-economic, cultural and demographic attributes are discernible Studying the fertility behaviour of respondents staying in a state like Assam can provide an understanding of the process of transition from high to a low fertility in a situation where the whole range of fertility-related forces (i e, traditional as well as modern) are operative It will be possible to highlight the exact nature or relationships between fertility and its determinants through the application of multivariate analytical techniques based on National Family Health Survey (1992-93) data

1.5 Methodology

The methodology applied for analyses of data are as follows

In chapter-2, the analysis is done by applying the means procedure, which calculates subgroup means and related univariate statistics for the dependent variable within categories of one or more independent variables

To compare means for two groups of cases, the t-test statistic is

$$t = \frac{\text{difference between the means of the two groups}}{\text{standard error of the difference between the means}}$$

The standard error of the difference is a measure of the precision with which this difference can be estimated One can conclude from large absolute values of 't' that the samples were drawn from different populations A large 't' indicates that the difference between the treatment group means is larger than what would be expected from sampling variability alone (i e , that the differences between the two groups are statistically significant) A small 't' (near 0) indicates that there is no significant difference between the samples Degrees of freedom (d f) represents the sample sizes which affect the ability of the t-test to detect differences in the means As degrees of freedom (sample sizes) increase, the ability to detect a difference with a smaller 't' increases Correlation procedures measure the strength of association between two variables which can be used as a gauge of the certainty of prediction Unlike regression, it is not necessary to define one variable as the independent variable and the other as the dependent variable The correlation coefficient 'r' is a number that varies between '–1' and '+1' A correlation coefficient of '–1' indicates that there is a perfect negative relationship between the two variables with one always decreasing as the other increases A correlation coefficient of '+1' indicates that there is a perfect

positive relationship between the two variables with both always increasing together A correlation coefficient of '0' indicates no linear relationship between the two variables

The 'p' value is the probability of being wrong in concluding that there is a true difference in the two groups (i e , the probability of falsely rejecting the null hypothesis, or committing a Type I error, based on 't') The smaller the p value, the greater the probability that the samples are drawn from different populations Traditionally, we can conclude that there is a significant difference when $p< 0\ 05$

In chapters 3 and 4, an attempt has been made to quantify the intensity of a set of economic, socio-cultural and demographic characteristics in terms of their effect on probability of a dichotomous choice variable by applying multiple logistic regression technique

Let $Y_i = 1$, if the response from an individual is positive
$= 0$, otherwise

Having binary observation of the dependent variable creates two problems, one related to the nature of the error terms implicit in each observation and the other related to the functional form of the model Both types of error terms, whether those introduced by using the wrong functional form or those created by the dichotomous nature of the observations, are expected to be correlated with the values of the explanatory variables and thus lead to violations of the basic ordinary least square assumptions The possible alternatives are logit analysis, probit analysis and log-linear models Here the logit model is used because of its computation ease and desirable statistical properties Logistic regression is useful for situations in which we want to be able to predict the presence or absence of a characteristic or outcome based on values of a set of predictor variables It is similar to a linear regression model but is suited to models where the dependent

variable is dichotomous Logistic regression coefficients can be used to estimate odds ratios for each of the independent variables in the model Cox linear logistic model (1970) does not require any distributional assumptions concerning explanatory variables This logistic regression model can be used not only to identify risk factors but also to predict the probability of success The general logistic model expresses a qualitative dependent variable as a function of several independent variables, both qualitative and quantitative (Fox, 1984)

Using the subscript i to denote the ith individual, consider a loglinear model

$$E(Y_i / X_1, X_2, X_3, \quad , X_k) = [1 + \exp(-\beta X)]^{-1},$$

where X_i, (i = 1,2, , k) are the independent variables

The vector X represents a set of economic, socio-cultural and demographic characteristics and β is the column vector of unknown parameters associated with independent variable X

$$\text{If} \quad P_i = P(Y_i = 1)$$
$$1-P_i = P(Y_i = 0)$$

then

$$E(Y_i) = P_i = E(Y_i / X_1, X_2, X_3, \quad , X_k) = [1 + \exp(-\beta X)]^{-1} \qquad (1\,5\,1)$$

The equation (1 5 1) is known as the (cumulative) logistic distribution function This logistic model has been used extensively in analyzing growth phenomena [Kramer (1991)] Here conditional expectation of Y_i can be interpreted as the conditional probability of Y_i

$$\text{i e} \quad 0 \le P_i = E(Y_i / X_1, X_2, X_3, \quad , X_k) \le 1$$

The general logistic regression model can then be expressed as

$$L = \log_e[P/(1-P)] = \log_e P - \log_e (1-P) = \beta X \qquad (1\,5\,2)$$

The equation (1 5 2) expresses the log of the odds ratio as a linear function of the independent variables The principal advantage of this model (1 5 2) over the linear form of probability function is that the predicted values of the dependent variable are always constrained to the unit interval (0, 1) and thus does not violate its usual interpretation of probability To estimate the model, we need, apart from X, the value of the logit 'L'

But if we have data on individual families, then the equation (1 5 2) gives

$L = \log_e (1/0)$, if $P_i = 1$ and
$L = \log_e (0/1)$, if $P_i = 0$

The expressions for both the cases are meaningless Therefore, if we have data on individual level, we cannot estimate the model by standard OLS routine In this situation one may have to resort to the maximum likelihood method to estimate the parameters [Alfred (1992)] In logistic regression the parameters of the model are estimated using the maximum likelihood method and the significance test of the beta coefficients is often based on the wald statistic, which follows chi-square distribution The 'p' value is used to identify the significant effects to assess the relative importance of the selected variables in the logistic regression method A statistically significant odds ratio below 1 00 means a negative effect of an independent variable, while a statistically significant odds ratio above 1 00 means a positive effect

In chapter 5 we examine in sequence how (a) the desire for future birth is affected by economic, socio-cultural and demographic variables, (b) the contraceptive practice is affected by the socio-economic and demographic variables plus desire for future births and (c) the ultimate dependent variable, children ever born is affected by different socio-cultural and demographic

variables plus contraceptive practice To achieve the objectives mentioned above, simultaneous structural system of equations are considered with a presumed conceptual model A simultaneous structural system consists of equations in which a set of jointly dependent decision variables are explained by some of the dependent variables along with another set of predetermined or exogenous variables

In chapter 6 a regression technique is used to examine the net and joint effect of socio-demographic factors on fertility behaviour of currently married women in different reproductive age groups Regression analysis provides a variety of regression techniques including linear, logistic, non-linear, weighted, and two-stage least squares Each procedure has a model that relates a dependent (outcome or response) variable to an independent (predictor) variable or set of independent variables The simplest model is that for linear regression because it is an additive combination of parameters (coefficients) of the independent variables Multiple Linear Regression is similar to simple linear regression, but uses multiple independent variables to fit the general equation for a multidimensional plane

$$Y = b_0 + b_1 X_1 + b_2 X_2 + e \qquad (1\ 5\ 3)$$

where Y is dependent variable, the coefficients b_0 b_1, and b_2 are parameters (estimated by the procedure), X_1 and X_2 are independent variables and e is the error term

The regression model (1 5 3) is linear in both the data and in the parameters For each value of 'X', the independent variable, the Y's, the values of the dependent variable, should follow a normal distribution The mean of the Y's for each 'X' should fall along a straight line and their spread should be constant across the range of 'X' Linear Regression estimates the coefficients of the linear equation, involving one or more independent variables that best predict the value

of the dependent variable The coefficient 'b_1' is the slope, or regression coefficient (increase in the value of 'Y' per unit increase in 'X') As the values for 'X' increase by 1, the corresponding values for 'Y' either increase or decrease by 'b_1', depending on the sign of 'b_1' Regression is a parametric statistical method that assumes that the residuals are normally distributed with constant variance Because the regression coefficients are computed by minimizing the sum of squared residuals, this technique is often called least squares regression The true regression coefficients of the underlying population generally fall within about two standard errors (std error) of the observed sample coefficients Large standard errors may indicate multicollinearity The 't' statistic tests the null hypothesis that the coefficient of each independent variable is zero, that is, the independent variable does not contribute to predicting the dependent variable

The statistics 't' is the ratio of the regression coefficient to its standard error, i e

$$t = \frac{\text{regression coefficient}}{\text{std error of regression coefficient}}$$

One can conclude from large 't' values that the independent variable(s) can be used to predict the dependent variable (i e , that the coefficient is not zero) 'P' is the P value calculated for 't' The 'P' value is the probability of being wrong in concluding that there is a true association between the variables The smaller the 'P' value, the greater the probability that the independent variable helps predict the dependent variable Traditionally, an independent variable can be used to predict the dependent variable when $P < 0\ 05$

Chapter-2

SOME SELECTED SOCIO-DEMOGRAPHIC VARIABLES ON FERTILITY: AN ANALYSIS

2 1 Introduction

The pattern of human fertility is affected by several socio-economic, cultural and biological variables Fertility can be ascertained from statistics of births and a simple way of looking at the fertility pattern is to examine the mean number of children ever born per woman during her childbearing period [Barclay (1970)] It has been established through several studies [Bhargava (1984), Richard (1995)] that raising the female age at marriage tend to reduce fertility by shortening her reproductive life Mecarthy (1982) has shown that an increase in the age at marriage or a decline in percentage of ever-married women in a certain age group is an important factor in the decline of fertility in developing countries It has been argued that there could be a shift in the fertility pattern in favour of fewer children associated perhaps with factors like spouse's education and their expectation on family size Female education, particularly, bears a strong and consistently negative relationship to fertility Another interesting finding in the education-fertility relationship is the rise of individual fertility with a few years of schooling [Rob (1992)] Raising of female years of schooling contributes to the postponement of marriage, which in turn influence the lower fertility and smaller family size The impact of child-loss experience is often pronounced and the fertility of couple can be expected to be affected by such experiences to a great extent Any intimate link between child mortality and fertility levels would naturally enable in determining more suitable parameters for the population of effective population policies capable of bringing about a desirable degree of

impact on population control A comparative glance at available data indicates that the incident of infant mortality rate is much higher in India than in many of the developing countries In a state where the life expectancy of the infant is very low, couples want to produce more children so that a few may survive to attain adulthood Therefore, only a drastic reduction in infant mortality can motivate them to have fewer children as the fear of child loss would then be removed from their minds [Roy (1994)]

In this chapter, an attempt has been made to identify a set of socio-economic and demographic variables in terms of their effect on children ever born The group of socio-economic variables comprise of three parts-

(i) formal years of schooling of both husband and wife

(ii) religious status of the respondent

(iii) residential status as well as standard of living of the respondent

All of these socio-cultural variables are supposed to have an influence on demand for additional children in Assam In addition, demographic variables such as age structure of couples in the reproductive age groups, age at marriage, family size and child mortality also play an important role in fertility pattern The analysis is done by applying the means procedure, which calculates subgroup means and related univariate statistics for the dependent variable, children ever born, within categories of one or more independent variables

Fertility differentials by religion are large as well in Assam as in India In India, the total fertility rate (TFR) is 3 3 among Hindu women, 4 4 among Muslim women and 2 7 among women of all other religions combined (Christians, Sikhs, Buddhists, Jains and others) The fertility of Muslim women in Assam is relatively higher than Hindu women Hindus have experienced a sharp decline in fertility in past decades, resulting in a wider gap in current fertility between the Hindus and Muslims

Mean number of children ever born by Hindu & Muslim women

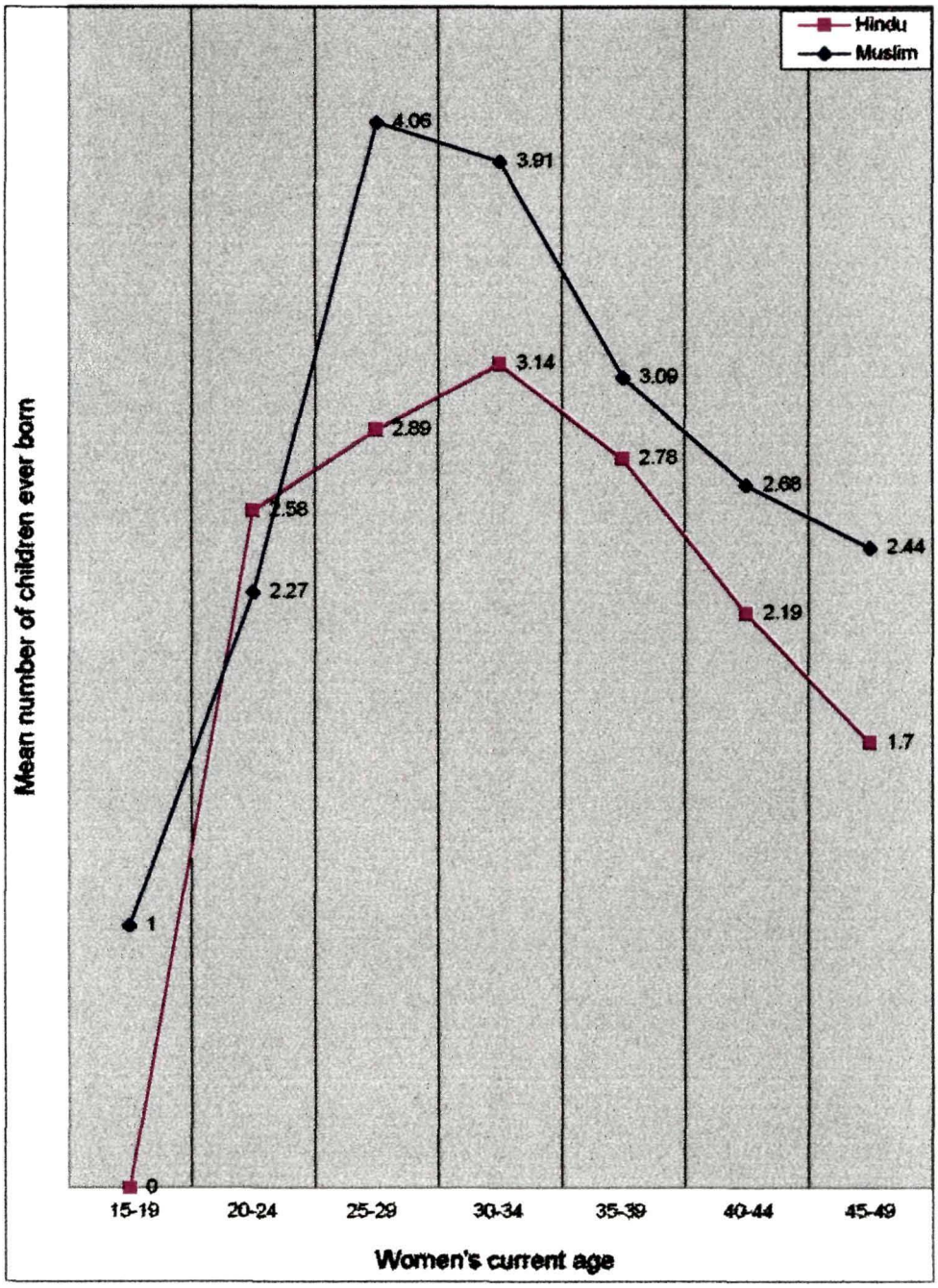


Fig.-2.1

Fig -2 1 reveals that fertility pattern of Hindu and Muslim women of Assam shows different types of distribution It shows almost a positively skewed distribution with peak in the current age 30 - 34 for Hindu women, whereas it shows a more or less symmetric distribution with peak in the age 20-24 for Muslim women The average number of children is seen to be merely 2 6 per Hindu women and 3 3 per Muslim women In India as a whole, fertility has fallen somewhat faster in urban areas than in rural areas The rate of fertility decline has been approximately the same in urban and rural areas of Assam (NFHS's Report,1995, Assam) Thus the present study focuses on the fertility patterns of currently married women in Assam with regard to Hindu and Muslim religions

2.2 Education and Fertility

Education is the widely reported variable which shows a consistently negative association with fertility Female education in particular bears a strong and consistently negative relationship with fertility Both the demographic transition literature and contemporary research have cited education as the single most important variable leading to large-scale fertility decline Caldwell(1981) and Birdsall (1977) have found that education had the highest predictive power in explaining the fertility differentials Another finding in the education-fertility relationship is the rise of individual fertility with a few years of schooling But it is also observed that the initial rise is followed by a much sharper decline as educational levels reach into the upper primary and secondary stages In the country as a whole, the total fertility rate (TFR) ranges from 4 0 among illiterate women to 2 3 among women who have completed middle school or more In relative terms, the TFR is 43 percent lower among women who have completed middle school than among illiterate women In Assam TFR is, on average, 59 percent lower among women who have completed middle school than among illiterate women (NFHS-1's Report, Assam) Bhuyan (1986) suggests an inverse relationship between the couple's formal educational level and their fertility as

measured by the number of children ever born So, a decline in fertility may be observed with an increase in the educational levels of both husband and wife In Muslim religion, the lowest mean years of schooling for both husband and wife are 9 2 and 5 8 years respectively and that for Hindu religion are 10 6 and 7 8 years The differences in mean years of schooling between the two religions are significant ($p<0.001$) for husband ($t = 5.88$) and wife ($t = -6.13$) in urban sector and for wife ($t = 7.43$) in rural sector It is observed that on the average 0 48 women have education above secondary level in urban group, followed by 0 12 in rural group Rural women exhibit disappointing performance in respect of female literacy, which is lagging far behind in comparison to the urban women The standard deviations of different groups in respect of wife's years of formal education indicates that it is the least in case of the Muslims (3 96) of rural areas and highest in case of the Muslims (4 37) of urban areas By calculating subgroup means for dependent variable 'children ever born' with respect to both husband's and wife's years of schooling, it has been observed that the graphical representation of the result is almost a positively skewed frequency curve for both Hindus and Muslims (Fig -2 2 and Fig -2 3) The curve for wife's educational level is less skewed than that for husbands with regard to mean number of children ever born This means that for both the religions educated women are relatively more homogenous than their uneducated counterparts with regard to average number of children ever born In case of women with atleast 10 years of schooling the number of children ever born per woman comes to 2 1 and in case of those below 10 years of schooling it comes to 3 3 In general the average number of children per woman is 2 9 in Assam An inverse relationship between educational level and fertility for both husband ($r = -0.35$) and wife ($r = -0.41$) is also noticed when calculated by the method of Pearson's coefficient of correlation

Fertility trend of Muslim women with their educational level

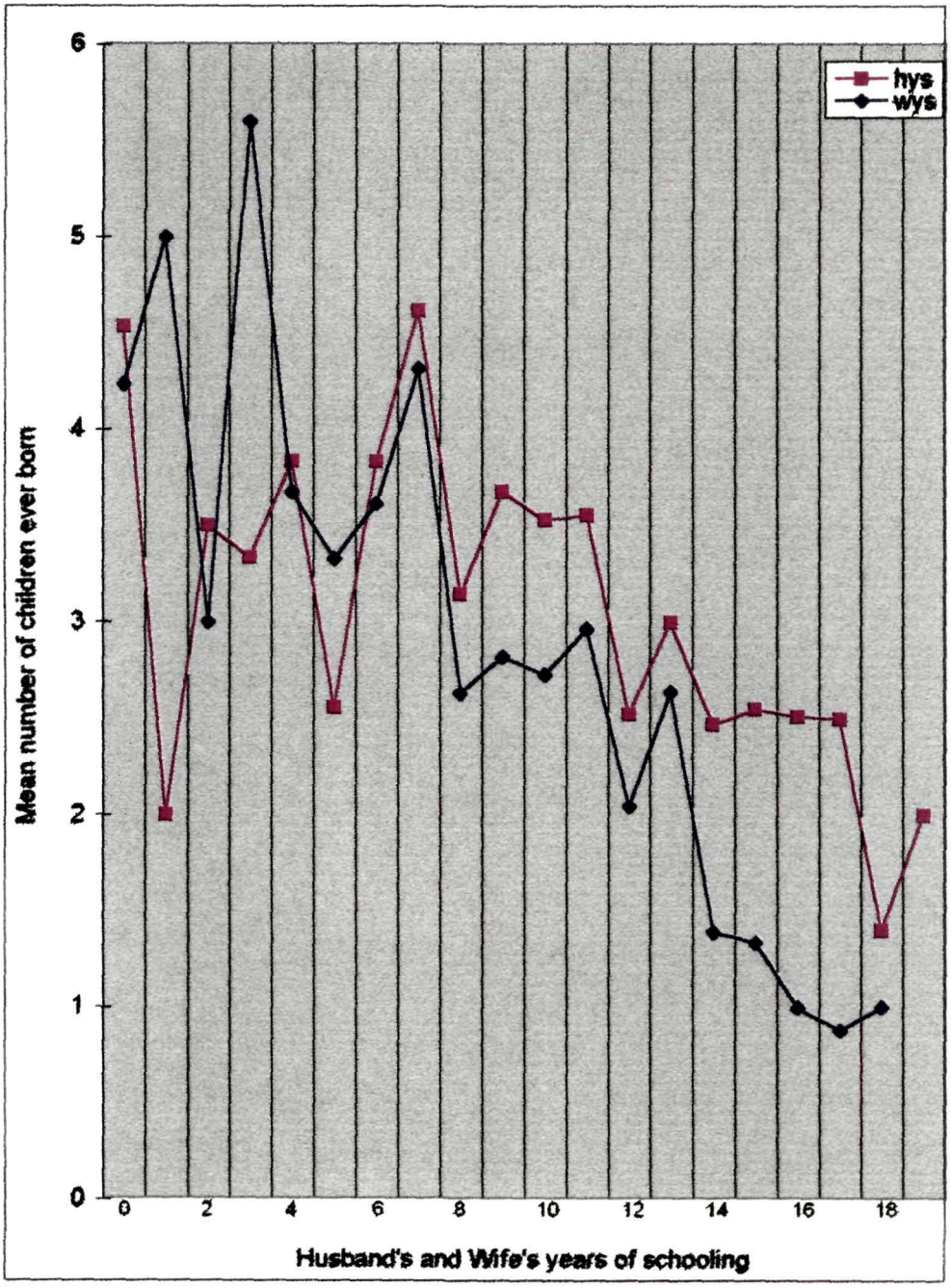


Fig.-2.2

Fertility trend of Hindu women with their educational level

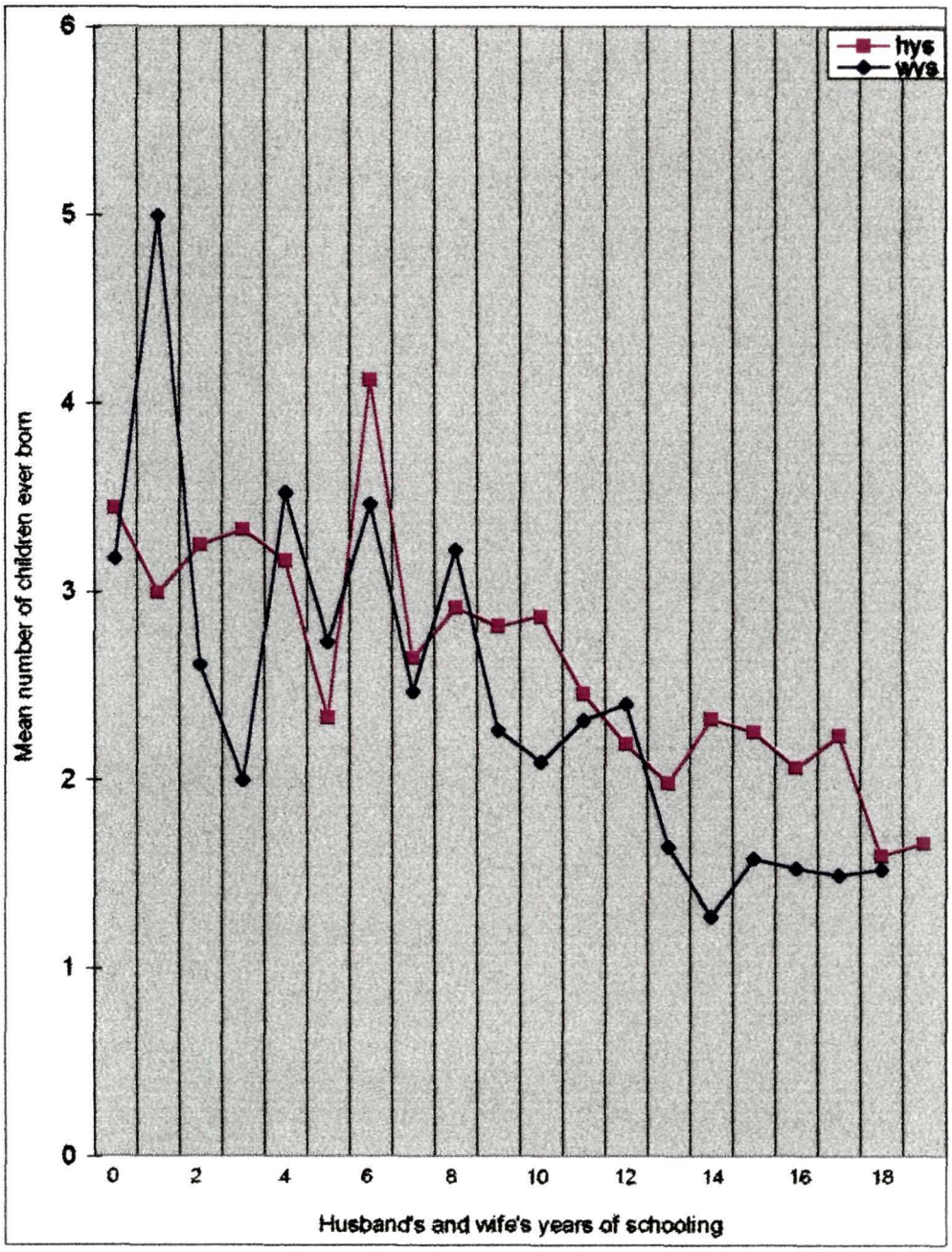


Fig.-2.3

The present study concludes that female education shows a significant negative association with fertility and it shows a more depressing effect upon fertility than male education The average number of children ever born per unemployed husband in the study area is 3 4, while the average number of children ever born per employed husband is 2 4 A significant opposite relationship(r = -0 30) has been noticed in between husband's occupational level and fertility Here also a decline in fertility is observed if the husband is employed It is also observed that employed husbands of Muslim religion have more mean number of children ever born (2 7) than that of their Hindu (2 4) counterparts A nominal number of wives have been engaged with occupation in both the religions

2.3 Age at marriage and Fertility

A significant feature of developing countries is low level of age at marriage of females and that is mainly responsible for higher growth of population The effect of age at marriage on the number of children has been studied in some details in the censuses of India since 1961 The analysis of a two percent sample of population from the census data of 1961 in some selected states revealed that lower the age at marriage, the greater is the number of children per married woman in both urban and rural areas (India, Registrar General 1961) Agarwala (1967) also pointed out the significant effect of late marriage on the fertility of Indian women He observed that there is sufficient evidence to suggest that while females marrying between age 14 and 19 have the same completed fertility, those marrying after 19 have a lower fertility The split data for Urban, Rural, Hindu and Muslim women show almost a similar type of distribution in respect of female age at marriage The mean female age at marriage for Urban, Rural, Hindu and Muslim women have been obtained as 20 49 years, 19 29 years, 20 56 years and 19 years respectively

Fertility trend of Urban and Rural women with their age at marriage

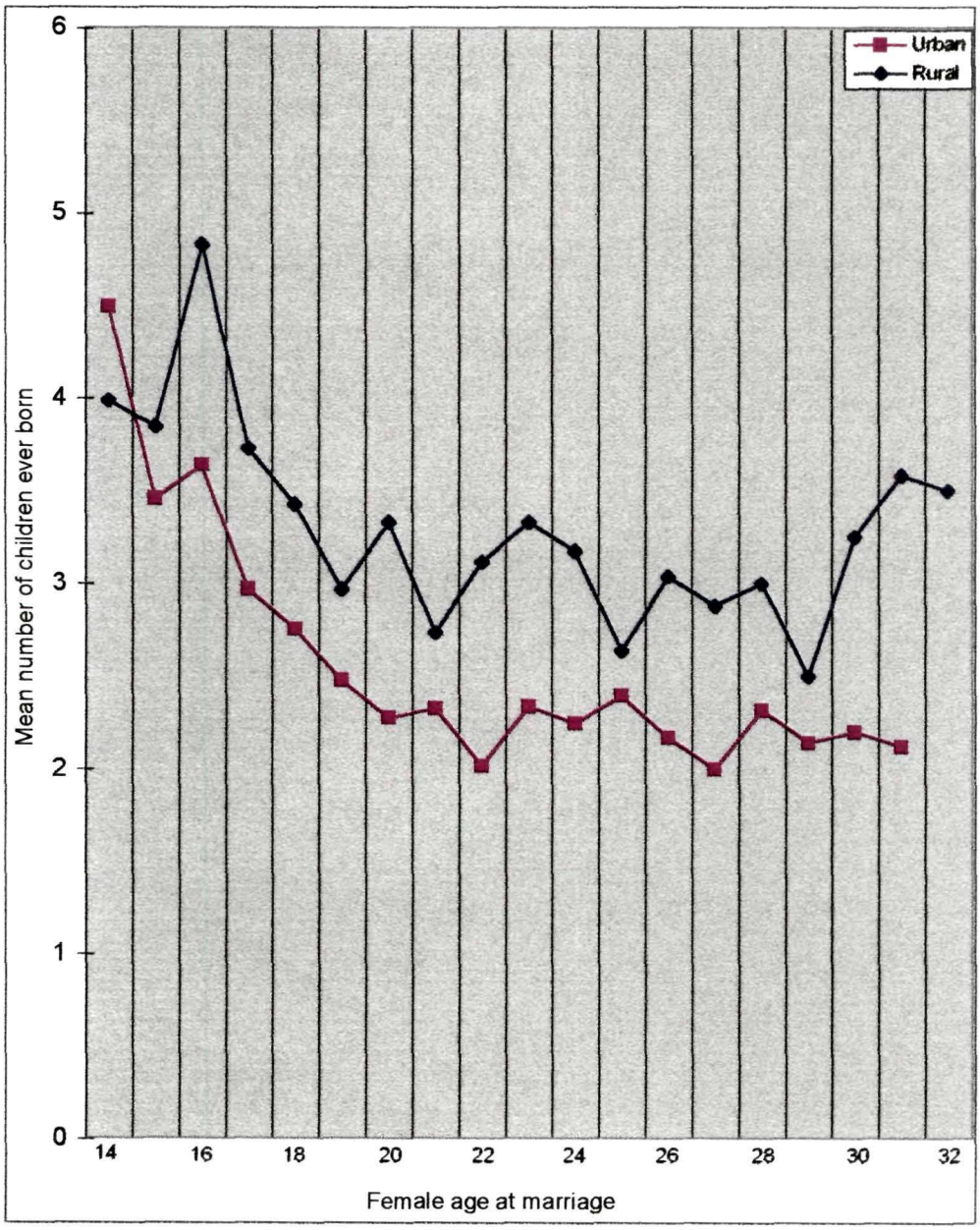


Fig.-2.4(a)

Fertility trend of Hindu and Muslim women with their age at marriage

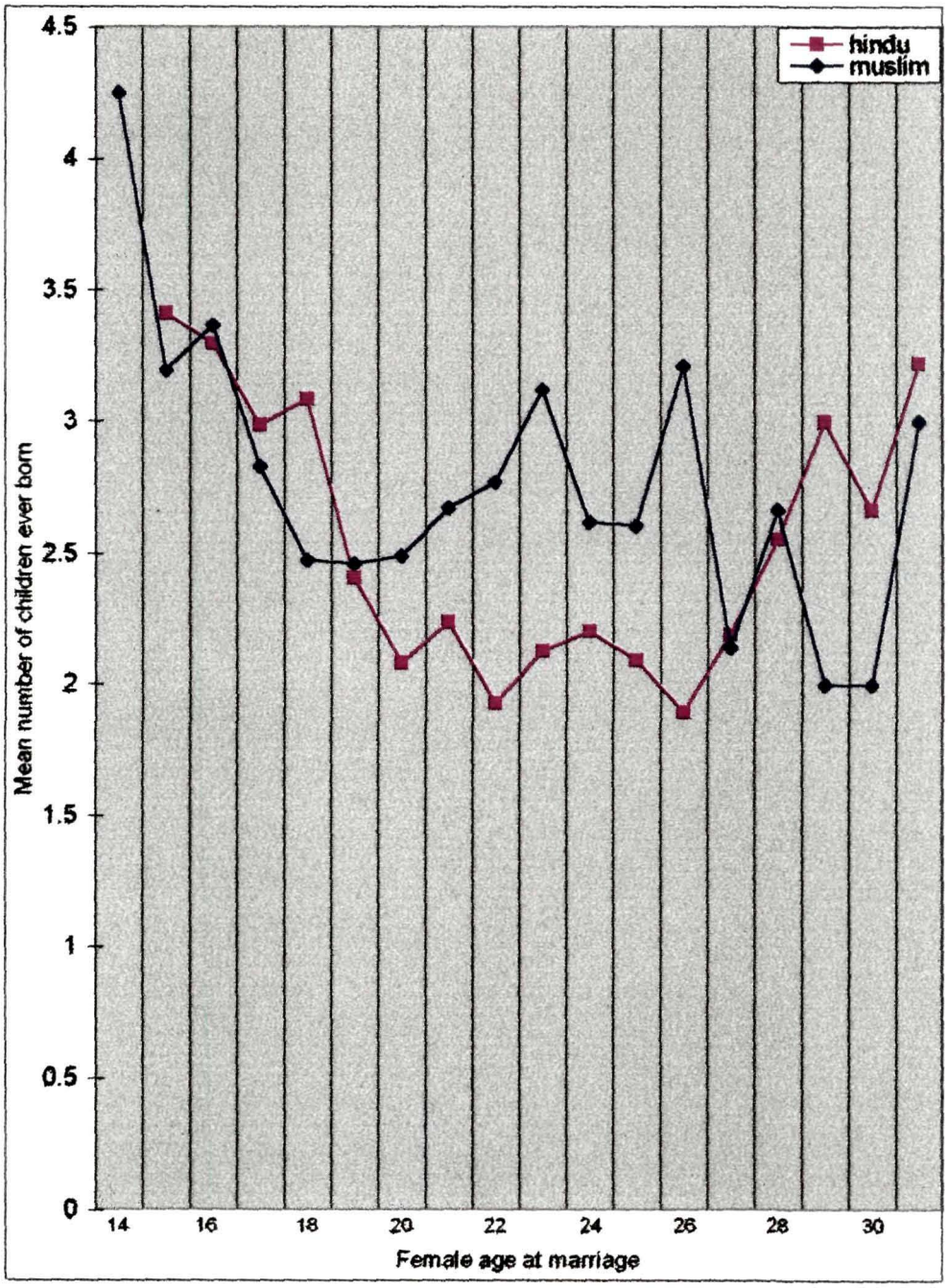


Fig.-2.4(b)

In urban areas, the highest mean female age at marriage for both Hindu and Muslim religions are 21 01 years and 19 8 years respectively and that in rural areas are 19 77 and 18 73 years respectively The differences in mean female age at marriage between the two religions are significant (p) Although a negative trend has been noticed between age at marriage and fertility in both the urban and rural areas (Fig 2 4(a)), the trend is not smooth for the Hindu and Muslim religions (Fig -2 4(b)) Table-2 1 gives the average number of children ever born to women by their current ages in years and their age at marriages

Table-2 1 Average number of children ever born by age group and age at marriage

Age at marriage	Average number of children ever born: Current age group of women (years)							No of women
(years)	19-24	25-29	30-34	35-39	40-44	45-49	All ages	(percentages)
				For Hindu women				
15-18	2 71	3 17	3 78	3 07	2 76	2 80	3 17	32 1
19- 21	-	2 50	2 97	3 17	2 89	1 90	2 83	31 7
22-24	-	1 20	2 71	2 48	2 04	1 58	2 07	23 1
25-27	-	1 50	2 38	2 29	1 94	1 69	2 02	8 9
28 +	-	-	2 25	2 02	1 90	1 60	1 98	4 2
All ages	2 71	2 7	3 28	2 92	2 27	1 86	2 50	100
				For Muslim women				
15-18	2 23	4 19	4 44	3 68	2 96	5 50	3 89	50 9
19- 21	-	3 76	4 32	3 48	2 61	3 60	3 52	24 4
22-24	-	3 13	4 22	2 81	2 75	3 50	2 96	12 7
25-27	-	1 16	3 20	3 23	2 29	3 00	2 98	8 7
28 +	-	-	2 87	2 53	2 33	-	2 76	3 3
All ages	2 23	3 87	3 72	3 22	2 61	4 00	3 43	100

The inverse relationship between age at marriage and fertility evident from these findings occurred irrespective of whether an age cohort estimate or an average of all the age cohorts was examined The fluctuations observed among some age groups could be the result of a possible bias in the reporting of age at marriage and current age The estimates established a negative trend between age at marriage and fertility in both the Hindu and Muslim religions For example, the average number of children ever born to Hindu women aged 30-34 years was 2 97 for those married between the ages of 19-21 and 2 71 for those married between the ages of 22-24 Similarly, for the women aged 35-39 years, the corresponding values for children ever born were 3 17 and 2 48 for the two respectively For Muslim religion, it is observed that the average number of children ever born to women aged 30-34 years was 4 44 for those married between the ages of 14-18 and 4 32 for those married between the ages of 19-21 Similarly for the women aged 35-39 years, the corresponding values for children ever born were 3 68 and 3 48 for the two respectively This suggests that age 21 and 19 are the critical ages of marriage for Hindu and Muslim women respectively, which indicates the direction of the inter-relationship between fertility and age at marriage

2.4 Child mortality and Fertility

Based on state level study (U P , India), Parmar (1990) has noticed that there is a significant positive association between infant mortality and fertility In our study it is observed that the women who had not suffered any child loss or had lost only one child produced the least number of children with an average of 2 7 Further, this average increased to 5 02 in the case of respondents who had lost two to four infants Thus, it is obvious that as the number of child death increases, the number of live births to the mothers also increases A positive correlation between child mortality and fertility was also noticed when the relationship was calculated by the method of Pearson's coefficient of correlation (r = +0 47) So, it may be

concluded that child mortality is one of the important factors in the determination of the fertility behaviour of women A similar finding was also found in the work of Prakasam (1980) and Pandey (1980)

2.5 Desire for additional children and Fertility

Demand for additional children (DAC) is ascertained through couple's desire for having additional children or not Preference for sons over daughters was also reflected in our data through average number of children ever born The estimates established almost a negative trend between number of living sons and fertility after achieving 3 living sons in both the religions However, the rate of increment of fertility with respect to number of living daughters is not declining fast in both the religions This suggests that the depressing effect of the number of surviving sons on mean number of children ever born is much larger than the effect of the number of surviving daughters The demographic aspect, desire for having additional children in Hindu religion (0 282), is about 1½ times larger on the average than in the Muslim religion (0 182)

2.6 Contraception and Fertility

Fertility decline is associated with an increase in family welfare adoption, and ever use of any contraceptive method is positively associated with an increase in educational levels [Bhuyan (1986)] Education tends to make the couple more inclined to keep their family size small because by spending a longer number of years at school, the age at marriage for boys and girls is raised and some modernizing attitudes favouring contraception are acquired by both genders In this study, although contraceptive use was low (47 6 percent) among women, there were significant variations in its use among women with different socio-economic and demographic characteristics The contraceptive use rate was found to be positively associated with number of living sons and daughters and

respondent's duration of marriage The level of education of both the respondents and their husbands seems to have a positive effect on the ever use of contraception The urban residents surpass rural residents in the use of contraception The experience of child loss has a negative effect on contraceptive use Those who do not desire additional children are more likely to be user of contraceptive methods than those who desire additional children Non-Muslims have higher use rates of contraception than Muslim women

2.7 Standard of living index and Fertility

The degree of standard of living status accorded to women in the family and society reflects the level of modernity of the people In the present study the variable standard of living index is considered as a measure for household wealth as well as a measure for accessibility towards modern ways of living This index is based on availability of electricity, toilet facility and having pure drinking water in their households In this study, more than half (60 6%) of the less modern respondents accorded a low standard of living and only (39 4%) gave a high standard of living index Women who enjoyed a high status of standard of living had on the average 0 71 fewer live births than their counterparts who were accorded a low status of standard of living The study also observed a negative association between the variable standard of living index and the fertility behaviour of women (r = -0 32) These findings reveal that if women have access to modern facilities in the house such as pure drinking water, toilet facility, electricity facility, their fertility is likely to be lower than those who do not have these modern facilities From the discussion it can be reasonably concluded that fertility is comparably lower among women who enjoy a high standard of living status in the society

Chapter-3

SON PREFERENCE AND ITS EFFECT ON FERTILITY

3.1 Introduction

Preference for male or female children or a balanced number of sons and daughters are common throughout the world Although it is usually assumed that sex preference can substantially influence fertility, some analysts argue that the effect is negligible An intermediate position is taken by those who say that sex preference may not have much impact in high fertility levels When average family sizes begin to fall, sex preference becomes a more important factor in fertility decisions Despite the keen interest that has been shown in sex preference, there is little empirical evidence of its effects on fertility Much of the researches in this area have highlighted on the importance of family size desires, sex preference, child loss experience and socio-economic conditions in respect of additional desired children The conclusions are based mainly on bivariate analysis of the data, though a few studies have also attempted multiple regression analysis Further, even the multiple regression technique has serious limitations for the analysis of determinants of demand for additional children due to variety of reasons However, when the dependent variable is dichotomous, the predicted probabilities obtained from the multiple regression analysis need not lie between 0 and 1, and the assumptions necessary for hypothesis testing are violated [Retherford and Choe (1993)]

In this chapter, an attempt has been made to quantify the intensity of a set of economic, socio-cultural and demographic characteristics in terms of their effect on probability of demand for additional children Demand for additional children being dichotomous choice variable depicting parental desire for having additional children or not, it can be analysed through logit analysis

The existence of preference for sons over daughters has been observed in Asian societies of East Asia, North Africa, the middle East and other parts of South Asia [Arnold (1996), Williamson (1978)] Some researchers [Bairagi and Langsten (1986), Das and Narayan (1984,1987)] argue that sex preference has a negligible effect on fertility, while others [Gulati (1987), Wen (1992)] contend that sex preference has inflated fertility rates in the past and will provide a barrier to future fertility declines Prakasam (1980) reports that infant mortality influences and is influenced by fertility and concludes that women who lost their children within 28 days of birth (neo-natal death) had their next pregnancy earlier than women who lost their children after 28 days of delivery (post neo-natal death) The explanation he offers for this is that infant mortality develops a high desire in the couples to have an early birth and more children and consequently, many of them donot practice contraception to limit their family size until they have a son or until they can assume that the son they have will survive Studies in India have identified three major factors that underlie son preference One is the economic utility of sons Sons are more likely than daughters to provide family labour on the farm or in a family business, earn wages and support their parents during old age Another important advantage of having sons is their socio-cultural utility In the context of India's patrilineal and patriarchal family system, having one son is imperative for the continuation of the family line, and many sons provide additional status to the family [Dyson and Moore (1983)] The utility of having sons arises from the important religious functions that only sons can provide According to the Hindu tradition, sons are needed to kindle the funeral pyre of their deceased parents and help in the salvation of their souls A strong preference for sons may be an obstacle to fertility decline if couples continue having children after reaching their overall family-size goal because they are not satisfied with the sex composition of their children Existing studies, however, do not demonstrate a consistently strong effect of son preference on fertility [Arnold (1992)]

Research on the relationship between son preference and fertility is confounded by the observation that the link is weak in both high-fertility and low-fertility populations In high-fertility societies, most couples continue to have their children regardless of number of sons and daughters they already have In low-fertility societies, the influence of son preference is also weak because a few couples are desirous to have more than two children even if they don't achieve their ideal number of sons and daughters The effect of son preference on fertility, therefore, is thought to be most pronounced in countries (like India) which is now in the middle of the fertility transition

The NFHS-1 (1992-93) analysis [NFHS-1's Report India (1995)] shows that son preference is evident throughout India, although it is relatively weak in Goa and southern India (except for Karnataka) The ideal numbers of sons exceed the ideal number of daughters by 20 to 80 percent in all states Son preference is especially strong in Haryana, Rajasthan and Madhya Pradesh, but it is atleast moderately strong in all the states of northern, central and eastern India Son preference is comparatively weak, but still substantial, in western and southern India, as well as in Assam The degree of son preference in a state corresponds closely to the level of fertility there those states with the strongest son preference tend to have high fertility and those with the weakest, low fertility The most prominent exceptions are Delhi, Bihar and Assam, where fertility is high relative to the level of son preference [Mutharayappa et al (1997)] The NFHS-2 (1998-99) analysis shows that in India son preference is relatively weak in urban areas among literate women and among women living in households with a high standard of living Son preference tends to be stronger in the northern part of the country than elsewhere, especially in Uttar Pradesh, Rajasthan, Bihar, Haryana, Madhya Pradesh, Orissa and Arunachal Pradesh Weaker son preference is found in Meghalaya, Mizoram, Tamil Nadu, Kerala, Karnataka and Goa [NFHS-2's Report, India (2000)]

The study is focused on quantifying the intensity of preference for sons over daughters in terms of their effect on probability of desire for having additional children The demand or desire for additional children, being a dichotomous choice variable, analysed through a logit model is estimated by maximum likelihood procedure Also, the study intends to identify some of the crucial economic, socio-cultural and demographic variables influencing the demand for additional children The variables along the definitional aspects are included in the model, with relevant symbol and characterization depicted in Table-3 1

Table-3 1 Description of variables

Abbreviated Name	Variable	Limit of variable		Mean	Standard Deviation
		Lower limit	Upper limit		
HCA	Husband's Current Age in years	25	71	42 649	9 076
HYS	Husband's years of Schooling	0	19	10 036	4 849
HOC	Husband's Occupation (0=unemployed, 1=employed)	0	1	0 488	0 500
WYS	Wife's years of Schooling	0	18	6 889	4 877
WCA	Wife's Current Age in years	18	49	36 901	7 330
NLS	Number of Surviving Sons	0	4	1 511	0 938
NLD	Number of Surviving Daughter	0	4	1 230	0 853
HRL	Husband's Religion (0=Muslim, 1=Hindu)	0	1	0 548	0 498
DAC	Desire for Additional Children (0=no 1=yes)	0	1	0 219	0 413
RES	Residential Status (0=rural, 1=urban)	0	1	0 478	0 500

Demand for additional children (DAC) is ascertained through couple's desire for having additional children or not Present study purports to explain variation in the parental preference for additional children by a set of nine economic, socio-cultural and demographic variables

Economic variables In this category we have included husbands' occupation denoted by dummy variable In the context of Assam, this variable supposedly influences the demand for additional children

Socio-cultural variables This group of variables comprises three parts, namely formal years of schooling of both husband and wife, religious status of the respondent and residential status of the respondent All of these socio-cultural variables are supposed to have an influence on demand for additional children in Assam

Demographic variables Demand for additional children has often been viewed to be influenced by size and sex composition of the surviving children and couple's current age For this purpose, we have included the number of surviving sons (NLS) and daughters (NLD) and the current age of both the husband and wife in the study

3.2 Methodology

As stated in 1 5 of chapter-2, consider

$Y_i = 1$, if the couple demands for additional children
$= 0$, otherwise

Then demand for additional children (Y_i) is a dichotomous dependent variable reflecting binary choices Let us assume that the desire for additional children depends on a set of economic, socio-cultural and demographic characteristics to be represented by a vector X Let β be the column vector of unknown parameters associated with independent variable X Using the subscript 'i' to denote the 'ith' individual, the log-linear model is

$$E(Y_i / X_1, X_2, X_3, \ldots, X_k) = [1 + \exp(-\beta X)]^{-1},$$

where X_i, (i=1,2, , k) are the independent variables

If $P_i = P(Y_i = 1)$ = probability that a couple demands for additional children
$1-P_i = P(Y_i = 0)$ = probability that the couple does not demand for additional children

then

$$E(Y_i) = P_i = E(Y_i / X_1, X_2, X_3, \ldots, X_k) = [1 + \exp(-\beta X)]^{-1}, \qquad (3\ 2\ 1)$$

The general logistic regression model can then be expressed as

$$L = \log_e[P_i/(1-P_i)] = \beta X \qquad (3\ 2\ 2)$$

The equation (3 2 2) expresses the log of the odds ratio of demand for additional children as a linear function of the independent variables The variable selection has been made through stepwise regression method using both forward selection and backward elimination procedures The cutoff probability values used for entering a variable into the model (i e for forward selection) is 0 05, and for removing a variable from the model (i e for backward elimination) is 0 10

3.3 Analysis

The model specification for highlighting the desire for additional children (DAC) is of the form

$$DAC = f(HCA, HYS, HOC, WYS, WCA, NLS, NLD, HRL, RES) \qquad (3\ 3\ 1)$$

The logit maximum likelihood estimates of the structural coefficients are provided here as follows

$$\begin{aligned} DAC = {} & 4\ 834^{**} + 0\ 0436^{**}\,HCA + 0\ 0411\ HYS + 0\ 105\ HOC + 0\ 0761\ WYS \\ & (0\ 714) \quad (0\ 0124) \quad (0\ 0348) \quad (0\ 258) \quad (0\ 0384) \\ & - 0\ 188^{**}\,WCA - 2\ 083^{**}\,NLS - 0\ 959^{**}\,NLD + 0\ 179\ HRL + 0\ 636^{**}\,RES \\ & (0\ 0180) \quad (0\ 163) \quad (0\ 152) \quad (0\ 192) \quad (0\ 198) \end{aligned} \qquad (3\ 3\ 2)$$

where the numbers in the parentheses are the standard error of coefficients and
* denotes significance at $p<0\ 005$, ** denotes significance at $p<0\ 001$

3.3.1 *Intensity of Son Preference*

Mutharayappa et al (1997) confirmed that a preference for sons is widespread in India and that son preference affects fertility behaviour in every part of the country The quantification of the intensity of son preference can be done by performing significance test (3 3 3) on the extent of difference in the magnitudes of the coefficients of surviving sons and daughters [Gulati (1987)]

$$|t| = \frac{|\beta_{NLS} - 2\beta_{NLD}|}{\sqrt{var(\beta_{NLS}) + 4var(\beta_{NLD}) - 4cov(\beta_{NLS}\ \beta_{NLD})}} \qquad (3\ 3\ 3)$$

where β_{NLS} and β_{NLD} denote logit maximum likelihood estimates of the number of living sons and the number of living daughters respectively

A hypothesis is considered as follows-

H_0 $\beta_{NLS} = 2\beta_{NLD}$

i e the coefficient of the number of living sons (NLS) and 2 times the coefficient of the number of living daughters (NLD) are not significantly different from each other

In this study the quantity $|t|$ turns out to be 0 578 and is much lower than 1 96 (for H_0 $\beta_{NLS} = 3\beta_{NLD}$, $|t| = 1\ 839$), which is the critical value of t to mark the two to be significantly different from each other Thus the analysis clearly indicates that the intensity of son preference over daughters is of the order of 2 to 1 among mothers of Assam In other words, the depressing impact of surviving sons over daughters on the desire for additional children is more than two times

An alternative way of examining the preference of sons over daughters is to work out the probabilities of desire for having additional children with different sex composition of the surviving children The estimated probabilities can be interpreted as intensity of desire for additional children among mothers with different sex composition of surviving children, such as having one son or one daughter or some other combination of surviving children These probabilities are derived from the estimated equation (3 3 2) by changing the values of number of surviving sons and daughters while keeping other variables fixed The other variables are kept at their mean values presented in Table-3 1 for the sample and the estimated probabilities are presented in Fig -3 1(a)

Perusal of Fig -3 1(a) reveals that estimated probabilities of desire for having additional children among women with no children turns out to be 77 percent Furthermore, the probability of having additional children for women with one surviving son is 29 6 percent, whereas with one daughter it is as high as 56 4 percent If we turn the question round to ask how long a string of daughters would be needed so that the probability falls to around 30 percent, the answer comes out to be more than two Similarly, probabilities of having additional children can be worked out for females having different sex composition Fig -3 1(b) reveals that the probability with one son and one daughter turns out to be 14 percent, with two sons and one daughter it is 2 percent, but with one son and two daughters it is slightly high as 6 percent Thus, preference for sons over daughters is clearly reflected in terms of these probabilities

Both husbands' and wives' formal years of education bear insignificant impact on demand for additional children The wife's current age (WCA) has significant and negative impact on additional desired fertility Respondent's age turns out to be an important determinant of additional desired fertility Our results reveal that females having average 37 years of age with atleast 7 years of schooling have lesser demand for having additional children

Percentage of probability of desire for additional children

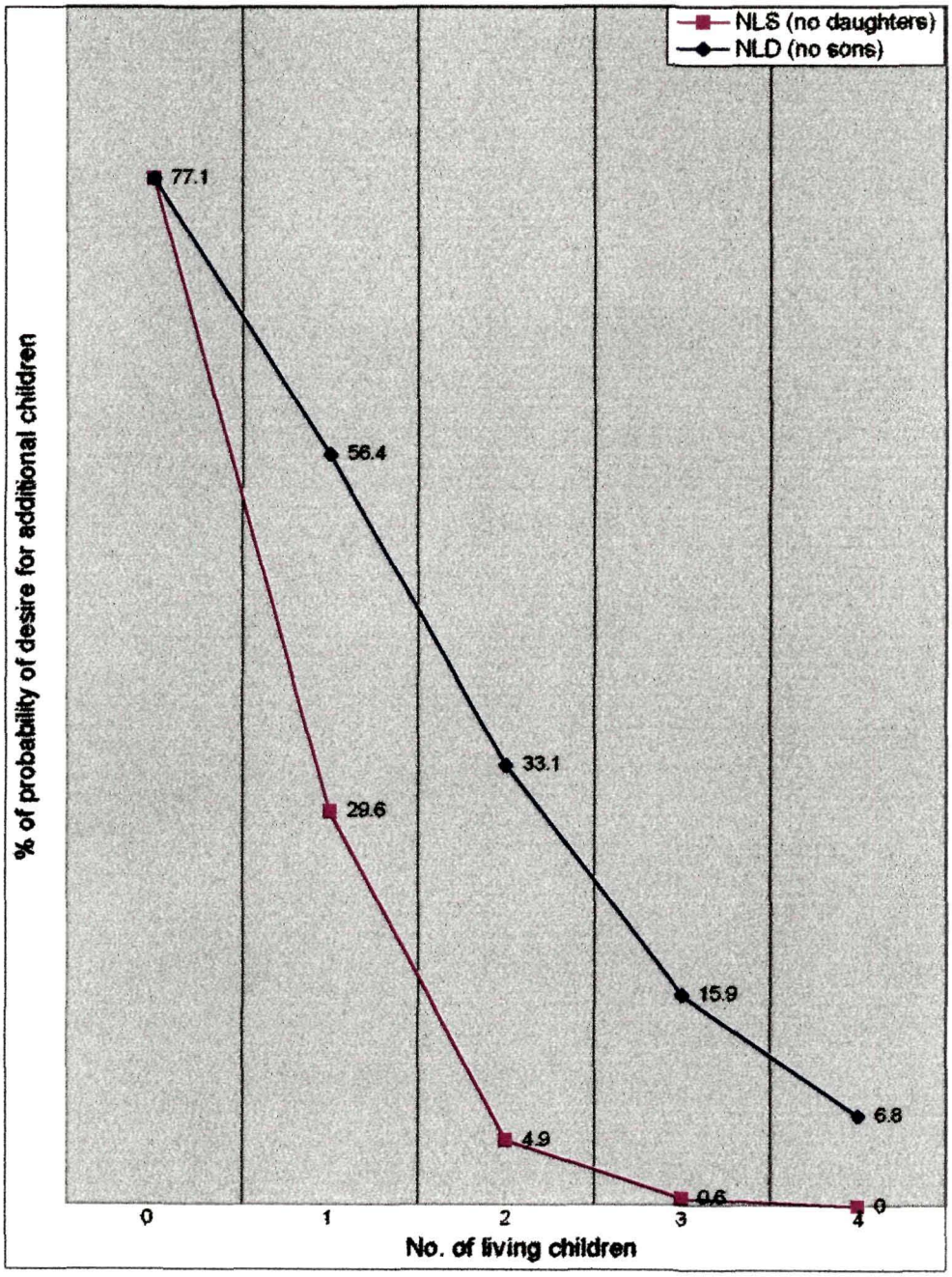


Fig.-3.1(a)

Percentage of probability of desire for additional children

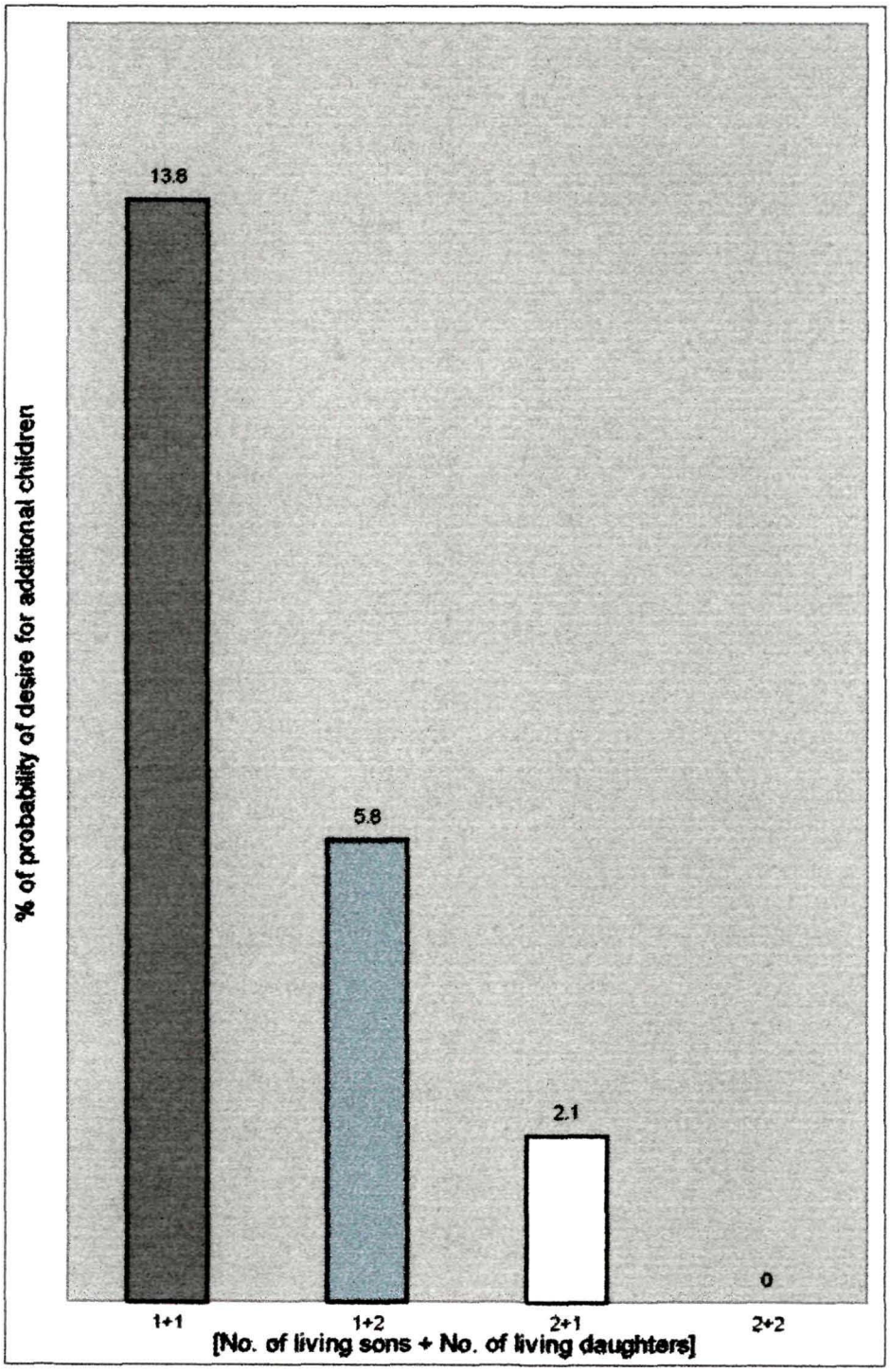


Fig.-3.1(b)

One can observe that two factors namely, husband's occupation (HOC) and husband's religious status (HRL) do not evince any significant influence on the desire for additional children, but the direction of influence of HOC is in general expectation A statistically significant urban/rural residential status is observed on the desire for having additional children

Preference for sons over daughters is also reflected in our data, which shows that the average desirable number of sons is higher than the average desirable number of daughters One surviving son turns out to be the crucial event beyond which the desire for additional children declines fast Number of surviving sons (NLS) as well as daughters (NLD) evinces significant and negative influence on the demand for additional children The depressing effect of the number of surviving sons on desire for having additional children is much larger (almost 2 2 times higher) than the effect of the number of surviving daughters Number of surviving sons and daughters emerged as the most influential factors, followed by women's current age in making decision about having additional desired fertility The study finds that son preference has a moderately adverse effect on the demand for additional children among women having one surviving son, beyond which the desire for additional children declines fast

3.4 Son Preference and Religion

The NFHS-1 (1992-93) analysis shows that among women who want another child, there is a strong preference for having a son as the next child In India, forty-nine percent say that they want a son, whereas only 11 percent express a desire for daughter, and the rest say that the sex of the child does not matter (21 percent) or that it is "up to God" (16 percent) In Assam, fifty-seven percent of women want the next child to be a son compared to only 15 percent who want the next child to be a girl Our study has also focused on the impact of the number of living sons on reproductive behaviour of women (r = 0 734) in Assam

Hindu women and number of living children

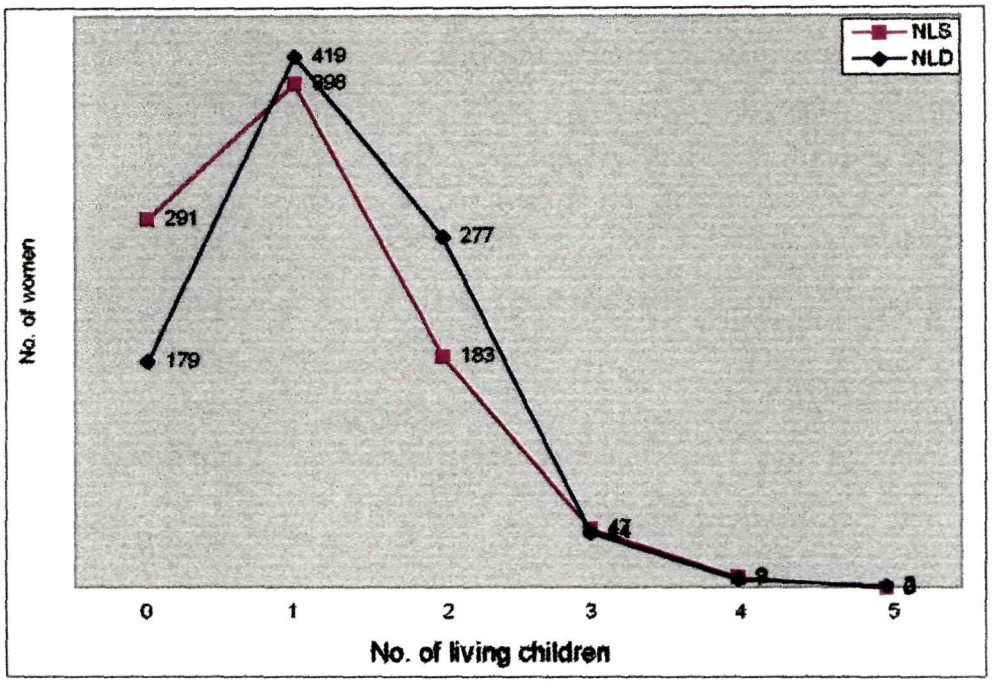


Fig.-3.2(a)

Muslim women and number of living children

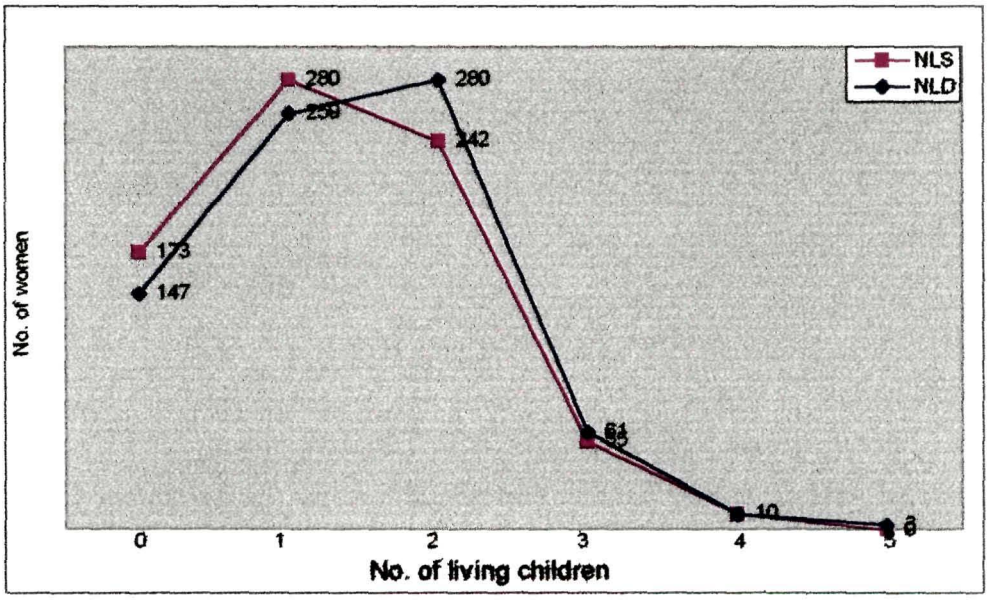


Fig.-3.2(b)

Note: NLS: Number of living sons, NLD: Number of living daughters.

Fig.-3.2(a) and Fig.-3.2(b) summarize the relationship between effect of son preference on fertility and women's religion. The effect of son preference is weaker among Muslims than Hindus.

3.5 Conclusion

Our study has focused on the impact of son preference on reproductive behaviour, which has been found to vary substantially between the Hindus and the Muslims. The desire for a son is more prevalent among the Hindu women than among the Muslim women. The study confirms that a preference for sons is somewhat more and that son preference affects fertility behaviour in Assam. Women express a strong preference for having atleast one son among their children. This study supports that the effect of son preference on fertility is generally strongest for group of women who have a moderate level of fertility.

Chapter-4

CONTRACEPTIVE PRACTICES AND ITS INFLUENCE ON FERTILITY

4.1 Introduction

It is well known that India, with long established family planning programmes, still has low rate of contraceptive use With the expansion of the family planning programme and the continuing wide gap between the set of target and actual achievement of the family planning programme, there has been considerable interest in determining what factors influence couple's decision to use contraception Several research studies [Rajaretnam (1995), Khuda, Roy & Rahman (2000)] have revealed significant influence of a number of relevant socio-economic, demographic and cultural factors on contraceptive use Traditional analysis of the effects of socio-economic factors on the use of contraception and recent analyses of contraceptive availability fail to establish any coherent framework regarding the adoption and use of deliberate control Also, the multiple regression technique has serious limitations for the analysis of determinants of contraceptive use due to a variety of reasons As the dependent variable is a dichotomous response variable that was assigned the value of '1' if the respondent was using any contraceptive method, and '0' for not using any method, the predicted probabilities obtained from the multiple regression analysis do not lie between '0' and '1', and thus the assumptions necessary for hypothesis testing are violated So the logistic regression model can be used to identify risk factors and to predict the probability of success

In this chapter we try to study the use of contraception among currently married women of reproductive age in Assam, with particular focus on the extent to which socio-economic and demographic factors exert independent influence on contraceptive use More specifically, this study examines the effect of family size desire, sex preference, child-loss experience and some selected socio-economic factors on ever use of contraceptive method among currently married women by applying multiple logistic regression technique

India is the first country in the world to initiate an officially sponsored family planning programme as early as in 1951 However, with the creation of a separate department of family planning in mid 1960s, greater emphasis was attached to this programme, and since then contraceptive use rates increased steadily According to the NFHS-1 [NFHS-1's report, Assam (1995)], the knowledge of family planning is nearly universal in Assam, with 99 and 97 percent of ever-married women in urban and rural areas respectively, recognizing atleast one modern method of family planning Every three out of five currently married women have ever used more than one methods of family planning The age pattern of ever users of modern methods is slightly different in urban and rural areas, it peaks in the 30-34 age group in urban areas, whereas it is in the age group 35-39 in rural areas At each age, however, ever users are higher for urban than rural women In the case of use of contraceptive methods, the difference is most evident between the illiterate and literate women Religious differences in the use of contraception are even more substantial than the differences by education The contraceptive use rate is only 19 percent among Christian women, 48 percent among Hindu women and 32 percent among Muslim women

Pandey (1980) observes that infant mortality develops a high desire in the couples to have an early birth and more children and consequently, many of them do not practice contraception to limit their family size until they have a son or till they can assume that the son they have will survive In this context, to study the

effect of the sex composition of living children on contraceptive use, the number of living sons and daughters are included in the model The socio-economic variables include religion, residential status, standard of living index, respondent's duration of marriage, occupation of husband and education of both husband and wife In addition to these variables, couples' desire for additional children is also included in the model Standard of living index can be considered as a measure for household wealth as well as a measure for accessibility and modern ways of living This index is measured by the availability of amenities in the household, namely type of toilet facility, type of houses, availability of electricity and drinking water facility etc In this chapter we examine the use of contraception among currently married women of reproductive age in Assam, with particular focus on the extent to which socio-economic and demographic factors exert independent influence on contraceptive use

4.2 Methodology:

As in 5 1 of chapter-2, consider

$Y_i = 1$, if the couple ever use any contraceptive method
$= 0$, otherwise

Then the ever use of contraceptive (Y_i) is a dichotomous dependent variable reflecting binary choices Let us assume that the ever-use of contraceptive method by currently married women depends on a set of economic, socio-cultural and demographic characteristics to be represented by a vector X Using the subscript 'i' to denote the 'ith' individual, the loglinear model is

$$E(Y_i / X_1, X_2, X_3, \quad , X_k) = [1 + \exp(-\beta X)]^{-1},$$

where X_i ($i = 1,2, \quad , k$) are the independent variables and β is the column vector of unknown parameters associated with independent variable X

If $P_i = P(Y_i = 1) = Pr$ (a couple uses any contraceptive method)
$1-P_i = P(Y_i = 0) = Pr$ (a couple does not use any contraceptive method)

then the general logistic regression model can be expressed as

$$L = \log_e[\, P/(1-P)\,] = \log_e P - \log_e (1-P) = \beta X \qquad (4\ 2\ 1)$$

The equation (4 2 1) expresses the log of the odds ratio of use of any contraceptive method by currently married women as a linear function of the independent variables

4.3 Discussion

In performing stepwise regression method for the determination of significant variables, 11 variables were initially selected for logistic regression method The cutoff probability values used for entering a variable into the model (i e for forward selection) is 0 05 and for removing a variable from the model (i e for backward elimination) is 0 10 The results are presented in the form of logit regression coefficient, odd ratio and p value In this study, although contraceptive use rate was low (47 6 percent) in Assam, there were significant variations in its use among women with different socio-economic and demographic characteristics The contraceptive use rate was found to be positively associated with number of living sons and daughters and respondent's duration of marriage The level of education of both the respondents and their husbands seem to have a positive effect on the ever use of contraception Urban residents surpass rural residents in ever use of contraception The experience of child loss has a negative effect on contraceptive use Child loss in this study is coded as a dummy variable indicating whether or not the mother has experienced any loss of a child Those who do not desire additional children are more likely to be user than those who desire additional children The variable standard of living index also has positive effect on contraceptive use Non-Muslim women have higher use rates than Muslim women

The model specification for highlighting the ever use of contraceptive method (COM) is of the form:

$$COM = f(HYS, HOC, HRL, WYS, DAC, RES, SNLI, CHE, RDM, NLS, NLD). \quad (4.3.1)$$

Here COM = 1, if the couple uses any contraceptive method
0, otherwise.

Table-4.1: Logistic regression coefficients of the selected Socio-demographic factors on the use of contraceptive methods by currently married women.

Variable	Abbreviated Name	Logistic Coefficient	wald statistic	p value
Constant		-3.223	42.147	<.001
Husband's years of schooling (Max.=19, Min.=0)	HYS	-0.0003	0.00006	0.994
Husband's occupation (Employed=1,unemployed=0)	HOC	-0.622	2.806	0.094
Husband's religion status (Hindu=1, Non Hindu=0)	HRL	0.0067	0.0009	0.975
Wife's years of schooling (Max.=18, Min.=0)	**WYS**	0.5680	145.586	<.001
Desire for additional children (Yes=1, No=0)	**DAC**	-7.980	256.895	<.001
Residential status (Urban=1, rural=0)	**RES**	6.8220	47.010	<.001
Standard of living index	**SNLI**	8.840	65.369	<.001
Child loss experience (Yes=1,No=0)	CHE	-0.368	2.728	0.099
Respondent's duration marriage (Max.=34, Min.=0)	RDM	-0.032	1.32	0.251
Number of living sons (Max.=4, Min.=0)	NLS	0.241	13.374	<.001
Number of living daughters (Max.=5, Min.=0)	NLD	-0.218	2.670	0.102

Table-4 1 shows the logistic regression estimates of odd ratios for the effects of selected demographic and socio-economic characteristics of currently married women of reproductive age on ever use of contraceptive method The analysis shows that the significant variables are respondents' level of education, their desire for additional children, place of residence, number of living sons and the standard of living index The remaining explanatory variables namely occupation of husbands, experience of child loss, respondent's duration of marriage, the number of living daughters, religion of respondents, and husband's educational level do not seem to have significant independent effects on the ever use of contraception The effect of respondents' education on ever use of any contraceptive method is found to be the most important one The positive impact of the wife's level of education on the contraceptive use indicates that women whose level of education was of a longer duration were more likely to be using contraceptive than women whose level of education was of a shorter duration As expected, education increases awareness and use of contraception Educated women may desire fewer children than their less educated counterparts The analysis suggests that desire for additional children also play an important role in the decision-making processes concerning contraceptive use The probability of being a contraceptive user is much larger among women who don't want more children compared to those who want more The logistic regression analysis shows that the variable standard of living index is significantly and positively related to ever use of contraceptive methods It is likely that the facility of household wealth as a measure for accessibility and toward modern ways of living provide opportunities to motivate women by providing them with counselling on use of contraceptive methods The region of residence plays an important role in contraceptive use Urban areas in Assam are often associated with education, better access to medical care as well as family planning and other social services

Consequently, rates of contraceptive use are expected to be higher in urban than rural areas Our analysis confirms that the probability of urban women being users of contraception were almost one and half times (1 46) higher than that of rural women The prevalence of contraceptive use varies with sex composition of living children The probabilities of using contraceptive method can be worked out for females having different sex composition of living children These probabilities are derived from the estimated model by changing the values of number of surviving sons and daughters while keeping other variables fixed (substituting mean values) The probabilities of one, two and three living sons (with no daughters) are turned out to be 57, 62 and 67 percent respectively, whereas the probabilities of one, two and three living daughters (with no sons) are turned out to be 47, 42 and 37 percent respectively (Fig -4 1)

Table-4 2 Estimated probability of ever use contraceptive use based on sex composition of surviving children

No of surviving sons (No Daughters)	1	2	3
Percent of probability	57	62	67
No of surviving daughters (No sons)	1	2	3
Percent of probability	47	42	37
(No of sons + No of daughters)	(2+1)	(1+1)	(1+2)
Percent of Probability	58	53	47

These figures are based on the estimated logit model for different values of number of living sons and daughters, while keeping other variables at their mean values

Probability of ever user of contraceptive method based on sex composition of surviving children

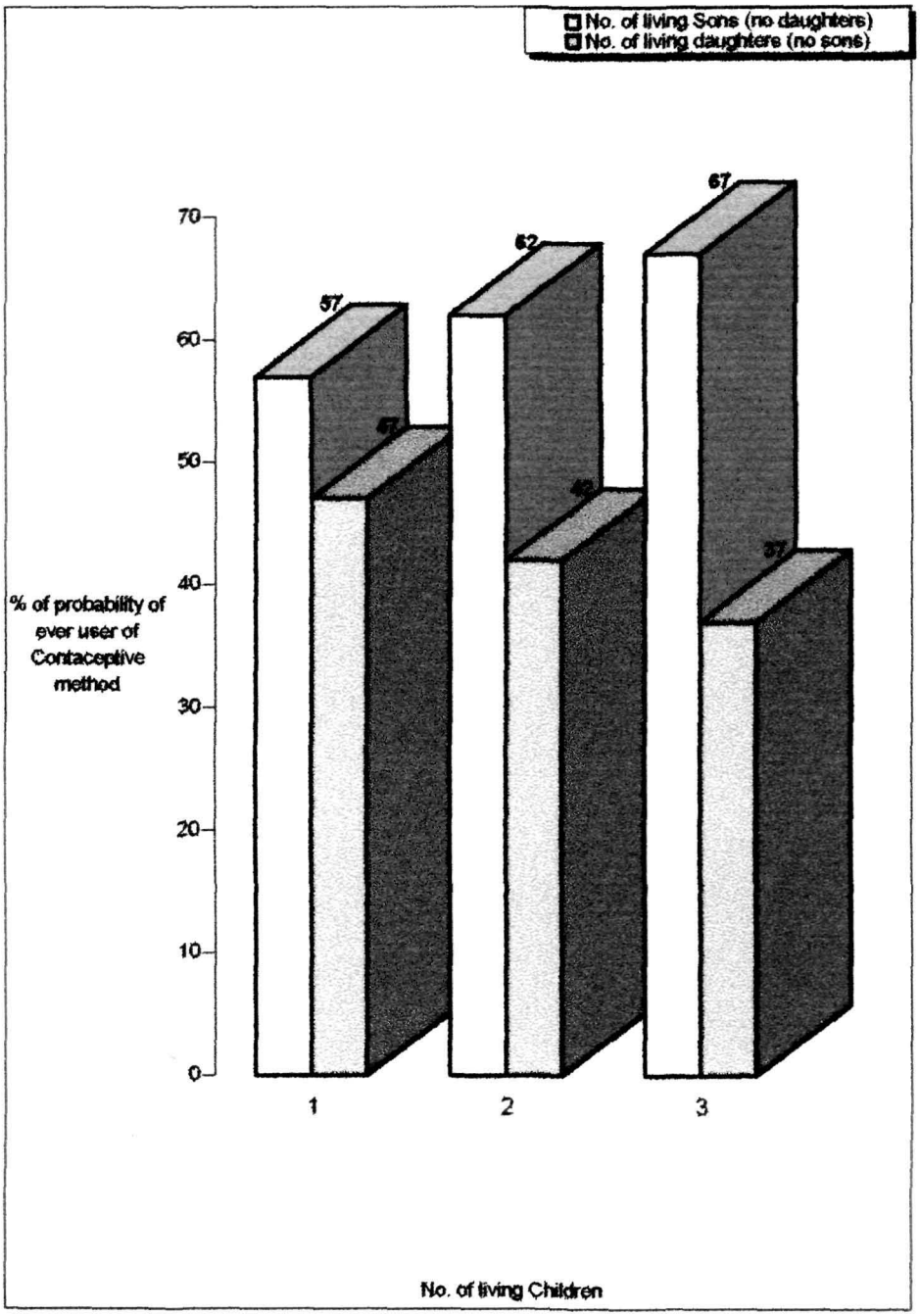


Fig.-4.1

Similarly, the probabilities with one son and one daughter turns out to be 53 percent, with two sons and one daughter it is 58 percent but with one son and two daughters it is slightly less as 47 percent Thus preference for sons over daughters is clearly reflected in terms of these probabilities This indicates that couples that have only daughters are less likely to use contraceptive methods than their counterparts who have atleast one son in addition to daughters Result (Table-4 1) shows that the experience of child-loss is not a significant predictor of ever use of contraception, but the negative sign of the regression coefficient suggests that with every increase in the number of children lost, current use of contraceptive decreases among currently married women Abeykoon (2000) has also noticed a similar result in Sri Lanka that the decline in infant mortality from 82 per thousand live births in 1950 to about 17 in 1996 has been another strong motivating factor in the reduction of fertility Since the early 1960s, it has become evident to married couples that the survival chances of their newborn infants are much higher than they would have been two decades earlier and they are able to attain their desired family size through contraceptive use The negative sign of regression coefficient of respondents' duration of marriage on contraceptive use indicates that shorter the duration of marriage of women, more is the likelihood of using contraception With regard to the selected demographic and socio-economic factors related to contraceptive use, the results from the NFHS-1's Report, Assam supports the hypothesis that women's education is the most important factor influencing the current use of contraception positively Couples' desire for additional children was found to be significantly and negatively associated with the use of contraception The positive sign of the regression coefficient corresponding to the standard of living index shows that women having modern facility in their households are more likely to practise contraception as compared to their complementary counterparts Urban areas in Assam are associated with

education and modern household facilities. Consequently, rate of contraceptive use is expected to be higher in urban areas than in rural areas. Child loss experience is found to be negatively associated with ever use of contraception. The preference for sons over daughters is reflected in terms of the probabilities of ever use of contraception. Among the demographic and socio-economic factors, the respondent's education level, religion as well as occupation of husbands are not found to have any significant net effect on the ever use of contraception.

Chapter – 5

A CONCEPTUAL MODEL OF FERTILITY BEHAVIOUR

5.1 Introduction

In socio-economic and demographic problems the study of fertility behaviour is based on a conceptual model [Bagozzi, Loo(1978)] A model guides researchers in selecting appropriate procedures of data collection and logical procedures of reaching conclusion In the field of fertility behaviour study, an initial conceptual model is necessary to take into account the numerous variables that affect fertility

In this chapter, a technique of structural equation modeling has been developed to explain the effects of some selected socio-economic and demographic factors on fertility

Path analysis is a method of decomposing and interpreting linear additive relationships among a set of variables by assuming that casual order among the variables are known and relationships among these variables are causally closed The virtues of path analysis are that it enables us to hypothesize a complex casual structure, draw a visual display of the model, calculate the strengths of the various relationships and insert their coefficients in the casual diagram In laying out a casual scheme, a list is prepared from demographic and socio-economic variables, which are related with fertility analysis Then, some of these independent variables are temporally ordered on the basis of their presumed occurrence during the life cycle of persons Next, we find a kind of relationship between any pair of variables that we have considered The relationship may be one of independence, cause-effect or reciprocity The last step is to develop a composite picture of the kinds of relationship between each variable and any of the others, which served the total pattern of causal relationship among the set of variables

In the path model, the casual ordering assumption implies assuming the direction of the effect of each variable on every other variable in the system If X precedes Y, X may affect Y but Y cannot affect X It is denoted by X→Y The casual closure assumption means that all casual effect between the variables used is not affected by other variable if X→Y, any outside variable affecting Y will be uncorrelated with X [Duncan (1966), Loebner (1973), Swanson (1980)] The assumption of casual ordering forces us to consider a simple model that includes only a few variables, as it would be very difficult to justify a casual ordering if too many variables are used A conceptual model of socio-economic and demographic variables with the assumption of casual ordering is diagrammed in Fig -5 1 It is noted that fertility behaviour (measured by number of children ever born) of a couple is affected by the background of both husband and wife The problem is of which background variables should be included in the model The variable standard of living index is common to both husband and wife and so the selection problem does not arise With regard to educational level, age at first marriage, and desire for future birth, there are problems in selection between husband and wife measures It is the fact that wife's age at first marriage is more relevant than that of husband's age in determining the length of time of wife's exposure to the risk of conception A preliminary test of consistency and validity of husband and wife's responses to the desire for future birth, contraceptive use may be worked out to represent an appropriate stronger effect from the study area

Cleland, Little and Pitaktepsomoati (1979) have noticed in Thailand that wife's response to the question on desire for future birth is more consistent than that of husband's response, whereas husband's education on contraceptive use seems to be stronger than the effect of wife's education Husband's and wife's background variables are related by a double-arrowhead straight line which represents a relationship between two variables These variables are placed first in

the sequence to indicate that these variables cannot be affected, but may affect the succeeding variables

A conceptual model for socio-economic and demographic variables

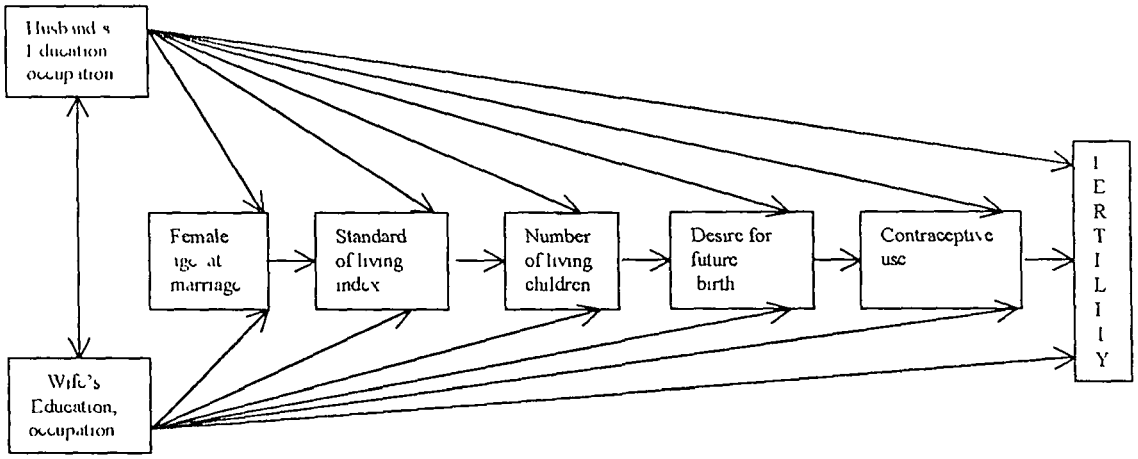


Fig -5 1

The casual relationship between education and fertility is complex and influenced by social, economic and behavioural variables Female education increases the age at marriage and also improves the likelihood that a woman has knowledge of modern contraceptives and may use them when needed The expected direction of causation is that as wife's formal education increases, delay in marriage occurs This leads to place female age at first marriage next to wife's education in the sequence of the model (Fig -5 1) Standard of living index can be considered as a measure for household wealth as well as a measure for accessibility and toward modern ways of living This index was measured at the time of survey, which was after the marriage of the couple interviewed It seems

more logical to place this after female age at marriage Standard of living reflects wealth and tastes toward materialism, it seems to be reasonable that this index affects the number of living children [Islam, Khan(1995)] Since rearing children is costly, it is more difficult for a couple with many children to accumulate wealth in a developing country like India In this situation, a couple's standard of living can be affected by the number of living children However, most parents are aware of the cost of living of children The desire for future birth should somehow be obtained from resources available to each family [Dwivedi (1992)] The number of living children determines the desire for future birth, which in turn determines the probability of current contraceptive use and number of children ever born (fertility) [Rajaguru (1983)]

5.2 Path Coefficients

This basic model (Fig -5 1) attempts to order a sequence of events with the assumption that these events occur in the same order for every individual Certain assumptions are considered in order to reduce the magnitude of the number of possible paths and facilitate computation of the path coefficients Most important is the elimination of direct or indirect reciprocal interaction from consideration The effective use of path analysis is based on a number of assumptions –the relationships among the variables are linear, additive and residuals are uncorrelated with each other There is only one-way casual flow in the system Under these conditions the parameters of the path –analytic models can be estimated with standard OLS procedures separately for each casual system of equation The only difference is that, in ordinary regression applications a dependent variable is regressed on all the explanatory variables under consideration Whereas, in path analysis more than one regression analysis will usually be undertaken [Dillon, Goldstien (1984)]

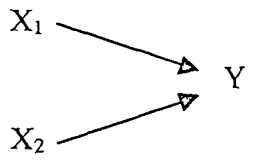
- If only one exogenous variable X has a direct casual impact on the endogenous variable Y, then the corresponding path coefficient $P_{yx} = r_{xy}$ is the simple correlation coefficient.

$$r_{xy} = \frac{1}{n}\sum XY, \quad \text{for} \quad X = \frac{U}{\sigma} \quad \text{and} \quad Y = \frac{V}{\partial}$$

where $U = X - \overline{X}$, $V = Y - \overline{Y}$.

The σ and ∂ are the standard deviations of X and Y respectively.

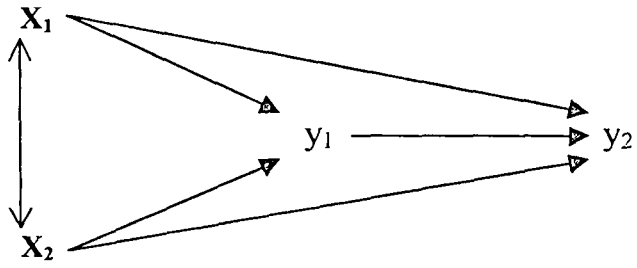
- If two exogenous variables X_1 and X_2 have casual impact on Y, then the path coefficients for X_1 and X_2 are the beta weights in the regression of Y on X_1 and X_2.



i.e. $Pyx_1 = byx_1$ and $Pyx_2 = byx_2$

Note that in the figure $byx_1 = ryx_1$ and $byx_2 = ryx_2$, since X_1 and X_2 are assumed to be uncorrelated.

- For two exogenous variables X_1 and X_2 and two endogenous variables Y_1 and Y_2, we can form four equations expressing all variables in standard score form.



$$X_1 = ex_1$$

$$X_2 = ex_2$$

$$y_1 = f(X_1, X_2)$$

$$= Py_1x_1 X_1 + P y_1x_2 X_2 + ey_1 \qquad (5.2.1)$$

$$y_2 = f(X_1, X_2, y_1)$$

$$= Py_2x_1 X_1 + Py_2x_2 X_2 + Py_2y_1 y_1 + ey_2 \qquad (5.2.2)$$

(e's are also expressed in standard score form.)

For the equation (5.2.1),

$$rx_1y_1 = \frac{1}{n} \sum X_1 y_1$$

$$= \frac{1}{n} \sum X_1 (Py_1x_1 X_1 + P y_1x_2 X_2 + ey_1)$$

$$= Py_1x_1 \frac{1}{n} \sum x_1x_1 + Py_1x_2 \frac{1}{n} \sum x_1x_2 + \frac{1}{n} \sum x_1ey_1$$

$$= Py_1x_1 + Py_1x_2 rx_1x_2,$$

and $$rx_2y_1 = \frac{1}{n} \sum X_2 y_1$$

$$= Py_1x_1 rx_1x_2 + Py_1x_2,$$

where $(\sum x_1x_1)/n = (\sum x_1^2)/n = 1,$

$(\sum x_1x_2)/n = rx_1x_2$ and $E(x_1ey_1) = 0$

The term $P_{y_1x_2} r_{x_1x_2}$ reflects the fact that y_1 is affected by both X_1 and X_2 that are themselves correlated. Replacing the path coefficients in regression weights-

$$\hat{\beta} = (x'x)^{-1}x'y = \begin{bmatrix} by_1x_1 \\ by_1x_2 \end{bmatrix}$$

where $X = \begin{bmatrix} 1 & r_{x_1x_2} \\ r_{x_1x_2} & 1 \end{bmatrix}$ and $y = \begin{bmatrix} r_{x_1y_1} \\ r_{x_2y_1} \end{bmatrix}$

For the equation (5 2.2),

$$r_{x_1y_2} = \frac{1}{n} \sum X_1 y_2 = P_{y_2x_1} + P_{y_2x_2} r_{x_1x_2} + P_{y_2 y_1} r_{x_1y_1}$$

$$r_{x_2y_2} = \frac{1}{n} \sum X_2 y_2 = P_{y_2x_1} r_{x_1x_2} + P_{y_2x_2} + P_{y_2 y_1} r_{x_2y_1}$$

$$r_{y_1y_2} = \frac{1}{n} \sum y_1 y_2 = P_{y_2x_1} r_{x_1y_1} + P_{y_2 x_2} r_{x_2y_1} + P_{y_2 y_1}$$

Replacing the path coefficients in regression weights –

$$\hat{\beta} = (x'x)^{-1}x'y = \begin{bmatrix} by_2x_1 \\ by_2x_2 \\ by_2y_1 \end{bmatrix}$$

where $X = \begin{bmatrix} 1 & r_{x_1x_2} & r_{x_1y_1} \\ & 1 & r_{x_2y_1} \\ & & 1 \end{bmatrix}$ and $Y = \begin{bmatrix} r_{x_1y_2} \\ r_{x_2y_2} \\ r_{y_1y_2} \end{bmatrix}$

The residual path coefficient from e to an endogenous variable y_i (i=1,2) is equal to $\sqrt{(1-R^2)}$, where R^2 is the squared multiple correlation coefficient of the endogenous variable y_i (i=1,2) with all those exogenous and endogenous variables that affect it

In this causal system the residual path coefficients are –

$$P_{ey_1} = \sqrt{1-R^2 y_1 x_1 x_2} \qquad \text{and} \qquad P_{ey_2} = \sqrt{1-R^2 y_2 y_1 x_1 x_2}$$

The standardized or path coefficients are related to the metric coefficients in the equations discussed above by a factor exactly equal to the ratio of the standard deviation of the predictor variable to the dependent variable, i e, the path coefficients can be obtained by multiplying the metric coefficients by the standard deviation of the predictor variable that are associated with and dividing the result by the standard deviation of the dependent variable Path analysis permits one to estimate the direct, indirect and joint effects of predetermined variables on the dependent variable The direct effect of variable X_i on variable X_j is given by P_{ji} and indirect effect of the variable X_i on X_j through X_k by $r_{ik}p_{jk}$ The total effect of the variable X_i on X_j is the sum of the direct effect of X_i on X_j and all indirect effects of X_i on X_j A path coefficient measures the strength of the relationship between any pair of variables included in the model If any path coefficent is atleast twice large in absolute value as their standard errors then they are statistically significant If some of the path coefficients turned to be both non-significant and negligible, one could have erased the corresponding paths from the path diagram and run the regression over, retaining only those independent variables found to be statistically significant

5.3 Path Analysis

The split data for Hindu and Muslim women shows different types of distribution in respect of children ever born (Fig -5 2) It shows a positively skewed distribution in Hindu women and a more or less symmetric distribution for Muslim women Thus the path model has been applied separately for two religious groups (Hindu and Muslim) of currently married women to study their fertility behaviour The variable selection has been made through stepwise regression method using backward elimination procedures The cutoff probability value used for removing a variable from the model (i e for backward elimination) is 0 10

The model (Fig -5 3) consists of six hierarchical sub models focused on six dependent variables (a) Female age at first marriage, (b) Standard of living index, (c) Number of living children, (d) Desire for additional children, (e) Contraceptive use and (f) Children ever born, the ultimate dependent variable

Description of variables

(a) Husband's years of schooling	(HYS)
(b) Wife's years of schooling	(WYS)
(c) Female age at first marriage	(FAM)
(d) Standard of living index	(SNLI)
(e) Number of living children	(NLC)
(f) Desire for additional children	(DAC)
(g) Ever use of contraceptive method	(COM)
(h) Children ever born	(CEB)

The standard of living index is considered as a measure for household wealth as well as a measure for accessibility toward modern ways of living This index is based on availability of electricity, toilet facility and having pure drinking water in their household

Number of Hindu & Muslim women with their children ever born

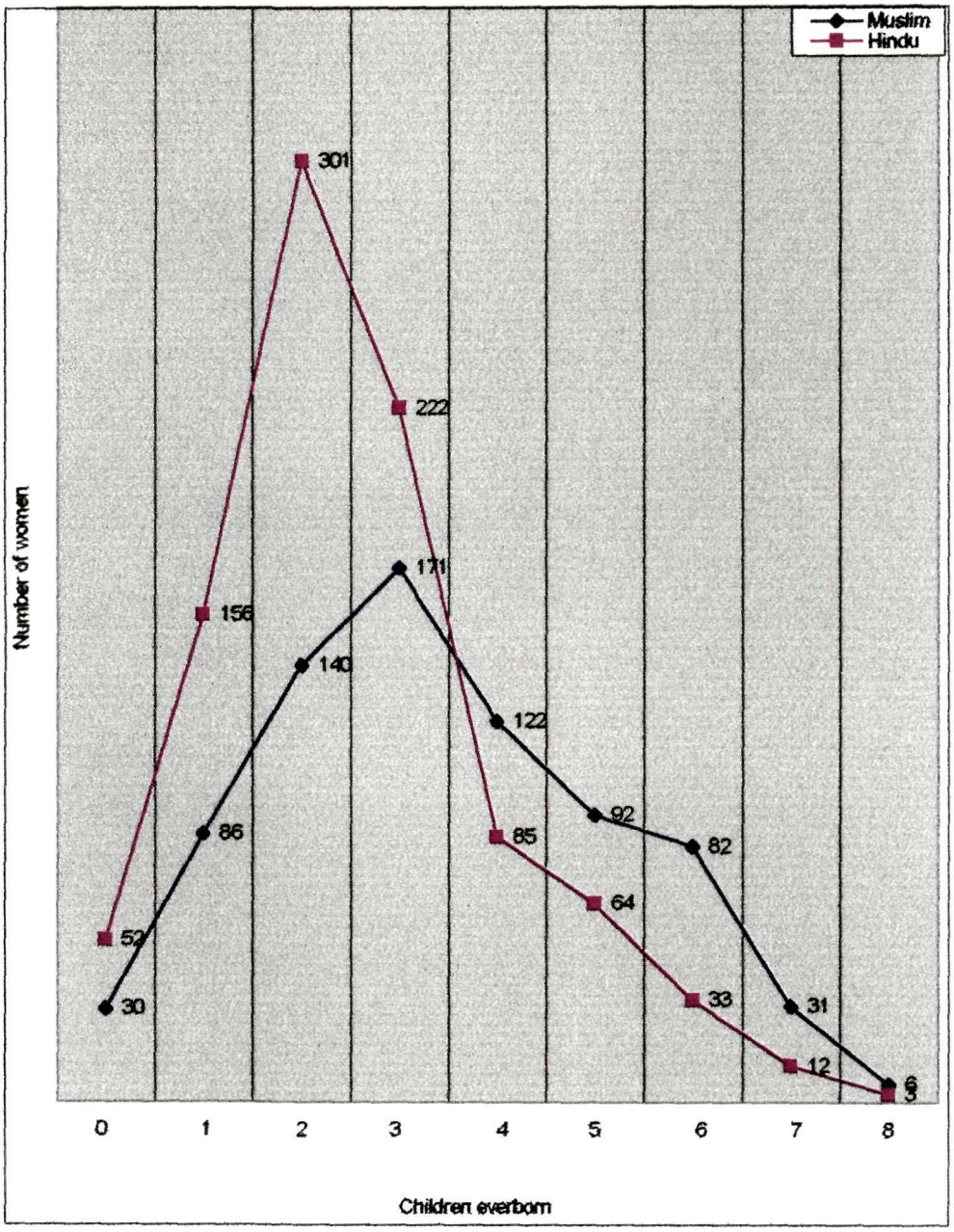


Fig.-5.2

Specifically, this study intends to examine the following aspects:

(a) How FAM is affected by spouse's years of schooling.

(b) How SNLI is influenced by all the variables given in (a) plus FAM.

(c) How NLC is influenced by predictor variables in (b) plus SNLI.

(d) How DAC is affected by all variables given in (c) plus NLC.

(e) How COM is influenced by predictor variables in (d) plus DAC.

(f) How the ultimate dependent variable CEB is affected by all variables in (e) plus COM.

Path model for fertility behaviour

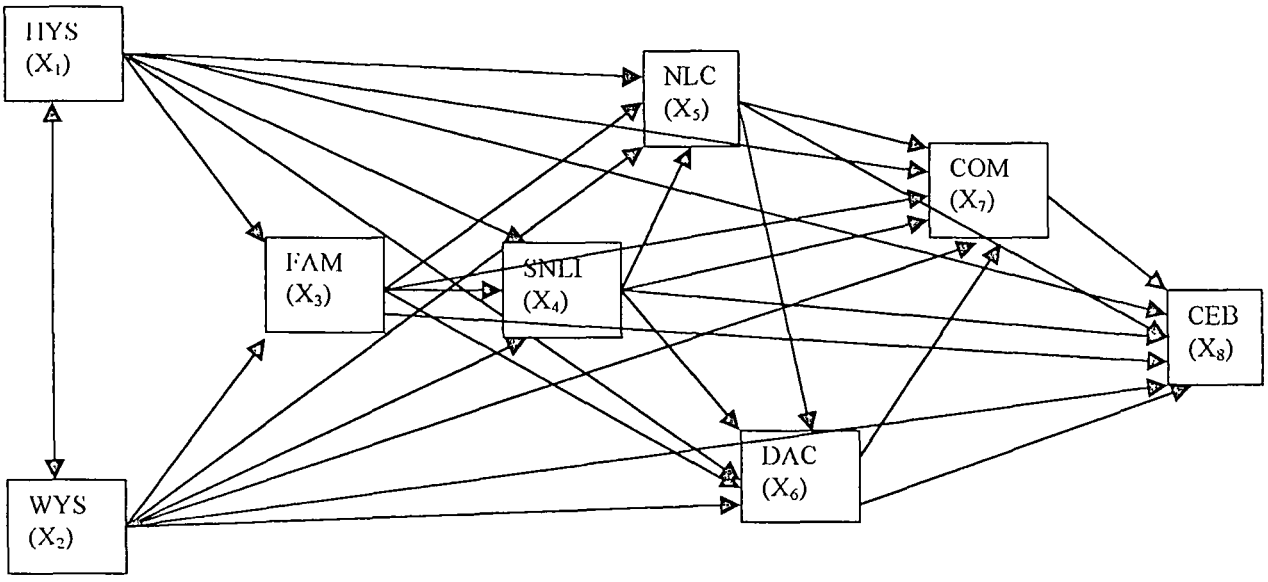


Fig.-5.3

Under the assumptions of the casual ordering presented earlier, a set of recursive regressions are fitted separately for each of the specified religious stratum in rural and urban sectors.

The regression equations are assumed to take the following form:

$$
\begin{aligned}
E(FAM) &= P_{31}\,HYS + P_{32}\,WYS \\
E(SNLI) &= P_{41}\,HYS + P_{42}\,WYS + P_{43}\,FAM \\
E(NLC) &= P_{51}\,HYS + P_{52}\,WYS + P_{53}\,FAM + P_{54}\,SNLI \\
E(DAC) &= P_{61}\,HYS + P_{62}\,WYS + P_{63}\,FAM + P_{64}\,SNLI + P_{65}\,NLC \\
E(COM) &= P_{71}\,HYS + P_{72}\,WYS + P_{73}\,FAM + P_{74}\,SNLI + P_{75}\,NLC + P_{76}\,DAC \\
E(CEB) &= P_{81}\,HYS + P_{82}\,WYS + P_{83}\,FAM + P_{84}\,SNLI + P_{85}\,NLC \\
&\quad + P_{86}\,DAC + P_{87}\,COM
\end{aligned}
\qquad (5.3.1)
$$

where P_{ji} ($i = 1,2,\ldots,7$; $j = 3,4,\ldots,8$) is the path coefficient of the direct effect of variable 'X_i' on variable 'X_j'.

The fitted regression equations of (5.3.1) are shown in Tables (5.1 to 5.6) for Hindu (combined rural and urban), Muslim(combined rural and urban), Urban-Hindu, Urban-Muslim, Rural-Muslim and Rural-Hindu groups respectively. The effects of predictor variables consist of direct, indirect and total effects on the dependent variable.

5.4 Path Model for Hindu women

Applying backward stepwise regression method, data from this study support the view that standard of living index and husband's education are not sufficiently important factors in studying fertility behaviour of Hindu women in rural and urban areas in Assam. Seven variables were considered to be potential predictors of fertility and they have been studied to determine their influence on fertility for

Hindu women belonging to rural and urban areas The recursive regression coefficients of the system of equations (5 3 1) of predictor variables on the children ever born for the Hindu women of urban and rural areas are presented in Table-5 3 and Table-5 6 respectively Although the variable, husband's educational level, has been removed from urban-Hindu path model, its effect has been found to be statistically significant on fertility for rural–Hindu women For both groups of residential status, the educational qualification of wives has a direct and total negative effect on children ever born The direction of the indirect effects of wife's educational level through female age at marriage, number of living children, desire for additional children and use of contraceptive method on children ever born are in opposite direction, as expected This suggests that educational status of wife is expected to induce a delay of age at marriage, higher standard of living and awareness about the use of contraceptive method Therefore, educational status of wife is expected to induce the couples to have limited and controlled childbirth Like wife's education, the age of women at marriage and the desire for additional children negatively affect fertility

Compared to the urban-Hindu group (Table-5 3), both the direct influence of age at marriage and desire for additional children on fertility is observed to be higher for the rural Hindu women Also the effect of wife's education on fertility for Hindu women is more pronounced in urban areas than in rural areas Owing to this reason, probably rural-Hindu women have more children ever born to them as compared to their urban-Hindu counterparts The number of living children has a direct and strong positive impact on fertility in both rural and urban areas Results show that the use of contraception has no significant effect on the children ever born, but the negative sign of the regression coefficient suggests that with the awareness in the use of contraception, the fertility is decreasing among the Hindu women

In the combined Hindu group for all rural and urban women, the variable, 'standard of living index', has been removed by backward stepwise regression The recursive regression coefficients of the system of equations and the summary of direct and indirect paths of the predictor variables for combined Hindu (rural and urban) groups are presented in Table-5 1 The direct positive effect of husband's years of schooling on fertility is found to be statistically significant The indirect effects of HYS on fertility consist of four different paths-through FAM, NLC, DAC, and COM, which affect children ever born in opposite direction Hence, the total effect of husband's years of schooling on children ever born is negative The variable wife's years of schooling have direct, indirect and total negative effect on CEB However, the effect of wife's years of schooling is more pronounced than the effect of husband's years of schooling on fertility The sign of direct effect of female age at marriage on children ever born is in expected direction and found to be statistically significant Clearly, a late marriage implies less time to give birth, hence the negative relationship exists between female age at marriage and the number of children ever born The indirect effect of female age at marriage on children ever born through NLC, DAC and COM are found to be negative However, the path FAM→NLC→CEB is more pronounced than the paths FAM→DAC→CEB and FAM→COM→CEB Hence, in a society where child mortality is relatively high, it is conceivable that some women want to have another birth in order to ensure that a certain number of children will survive The negative indirect effect of the path NLC→COM→CEB is not as strong as the positive direct effect of NLC on CEB So the total effect of NLC on CEB is in positive direction It implies that, on the average, higher the level of child loss in reproductive age of a woman, higher is the fertility and this relationship is found to be statistically significant The opposite direct effect of desire for additional children has turned out to be consistent with general expectations, i e higher

the proportion of women who are not desirous of additional children, lower is the fertility Although the effect of use of contraceptive method by currently married women on fertility is not found to be statistically significant, the sign of the effect in line is with general expectations It implies that the higher the proportion of women using contraceptive method, the lower is the fertility

Ideally, a zero-order correlation coefficient between CEB and any predetermined variable should be the same as the total effect of that predetermined variable on CEB A closer look at Table-5 1, 5 3 and 5 6 reveal that, with few exceptions, the zero-order correlation coefficients between CEB and each selected predetermined variable do not differ much from their corresponding total effects It should be pointed out that about 85, 87 and 82 percent of variances of fertility for currently married women belonging to the Hindu, urban-Hindu and rural–Hindu groups have been explained by the selected predetermined variables which are statistically significant

5.5 Path Model for Muslim women

Three path models have been constructed for Muslim women for combined group of rural and urban women, for rural and urban women separately Data from the combined group support the view that although standard of living index is not a sufficiently important factor in studying fertility behaviour of Muslim women, it has an influence on fertility of women belonging to rural and urban areas However, the variables, husband's educational level and use of contraception, have been removed by backward stepwise regression method from the models of urban and rural Muslim women respectively The recursive regression coefficients of the system equations (5 3 1) of the seven selected predictor variables on the children ever born for the Muslim women of urban and rural areas are presented in Table- 5 4 and Table- 5 5 respectively Although, the

husband's educational level is not a potential predictor of fertility in urban-Muslim areas, it has a statistically significant impact on fertility in rural-Muslim women For urban-Muslim women, the direction of the direct, indirect and total effects of husband's education is consistent with the general expectations For both the rural and urban areas, the educational status of wives has a direct negative impact on children ever born, whereas it has an opposite indirect impact on the same through FAM, NLC, DAC, and COM Hence, the total effect of wife's years of schooling on children ever born is negative This suggests that wife's education plays a significant role in age at marriage, in desire for additional children and in the use of contraceptive methods of Muslim women in both rural and urban areas However, the impact of wife's education on fertility for urban areas is more pronounced than that for rural areas The sign of direct effect of female age at marriage on children ever born is in expected direction The two indirect paths FAM→NLC→CEB and FAM→COM→CEB and the total effect of FAM on CEB have been found in opposite direction, as expected This suggests that late marriage implies less time to produce children, hence the negative relationship exists between female age at marriage and number of children born Household possession of modern facility measured by standard of living index has a negative direct influence on fertility in rural Muslim group For both the residential areas, the two indirect paths SNLI→NLC→CEB and SNLI→DAC→CEB have shown negative direction These findings reveal that if women have access to modern facilities in the house such as availability of electricity, toilet facility and having pure drinking water then their fertility is likely to be lower than those who do not have these modern facilities However, the impact of standard of living index on fertility for Muslim women is more pronounced in urban areas than in rural areas In both rural and urban residential areas, the direct effect of the number of living children on fertility and the indirect effect of the path NLC →DAC →CEB is positive So the total effect of NLC

on CEB is in positive direction. Hence, in a society where child mortality is relatively high, it is conceivable that some women want to have another birth in order to ensure that a certain number of children will survive. Both the direct and total effect of the desire for additional children on fertility is in opposite direction. Although the use of contraceptive method by Muslim women in rural areas is not an important factor to influence their fertility behaviour, it has shown a negative and significant association with fertility in urban areas. The opposite direct effect of use of contraceptive method on children ever born has turned out to be consistent with general expectations, i.e. women who are not habituated to the use of contraceptive method are more likely to have higher fertility.

The combined results for all urban and rural Muslim women (Table-5.2) show relatively different view on the impact of fertility. In the combined Muslim group the variable standard of living index has been removed by backward stepwise regression. The recursive regression coefficients of the system of equations and the summary of direct and indirect paths of the predictor variables for Muslim group are presented in Table-5.2. For both the variables HYS and WYS the sign of direct, indirect and total effect on children ever born are in expected direction. The indirect effects of HYS and WYS on fertility consist of four different paths-through FAM, NLC, DAC, and COM, which affect children ever born in opposite direction. Hence, the total effect of HYS and WYS on children ever born is negative. However, the effect of wife's years of schooling is more pronounced than the effect of husband's years of schooling on fertility. The sign of direct effect of female age at marriage on children ever born is in expected direction and statistically significant. The indirect effect of female age at marriage on children ever born through NLC, DAC and COM are found to be negative. Hence a substantial decline in fertility could be achieved by raising spouse's years of schooling and consequently age at marriage, particularly for female. Working on NFHS (1992-93) data [NFHS's Report, India(1995)] Choudhury (1996) has

also observed that the negative correlation between TFR with percentage of females attending school (in age 6-14) in the states in India is statistically significant. It suggests that in controlling fertility, schooling of females in the age group (6-14) plays a vital role. The direct effect of NLC on fertility is found to be in positive direction and statistically significant. The negative indirect effect of the path NLC→COM→CEB is not as strong as the positive indirect effect of the path NLC→DAC→CEB and positive direct effect of NLC on CEB. So the total effect of NLC on CEB is in positive direction. Results show that the experience of child-loss has significant effect on the children ever born, but the positive sign of the effect of NLC on CEB via DAC suggests that, with every increase in the number of children lost, demand for additional children increases among ever married women. Couple's desire for additional children was found to be significantly and negatively associated with the fertility behaviour of women. The opposite direct effect of desire for additional children has turned out to be consistent with general expectations. The effect of use of contraceptive method by currently married women on fertility is statistically significant and the sign of the effect agrees with general expectations. It implies that the higher the proportion of women who are aware about the use of contraceptive method, the lower is the fertility.

Table-5.2, Table-5.4 and Table-5.5 reveal that, with few exceptions, the zero-order correlation coefficients between CEB and each selected predetermined variable do not differ much from their corresponding total effects. It is also noticed that about 78, 82 and 69 percent of variances of fertility for currently married women belonging to the Muslim (rural and urban combined), urban-Muslim and rural–Muslim sectors have been explained by the selected predetermined variables respectively and are found to be statistically significant.

5.6 Conclusions

Wife's formal years of schooling negatively affects fertility either directly or through female age at first marriage and the number of living children An explanation for this relationship is that higher education leads to a late marriage resulting in higher chances of surviving children and less number of children ever born Educated couples are less likely to have desire for future birth that helps ultimately in declining fertility The results show that fertility among Hindu women is lower than among their Muslim counterparts The influence of wife's education on fertility is not potentially important in rural areas as compared to its influence on fertility in urban areas In conclusion, the negative effects of education on fertility have been widely established Hence, education, and girls' education in particular, is considered to be one of the important factors in the reduction of fertility The present study also confirms the negative effect of education on fertility Based on the findings, it may be suggested that attention should be focused on the need for enlarging educational facilities to women, and particularly to Muslim women in rural areas of Assam The female age at marriage plays a very dominant role on CEB FAM has an opposite indirect effect on CEB via NLC, DAC and COM on Muslim women of rural areas as well as on the combined religious groups (rural and urban) Child mortality appears to have a significant positive effect on fertility in Assam like elsewhere With regard to the selected demographic and socio-economic factors related to contraceptive use, the results from the NFHS-1 (1992-93) Assam, support the hypothesis that women's education is the most important factor influencing the current use of contraception positively Hindu women living in urban areas by virtue of their residence were much more likely to be exposed to various mass media on a regular basis and to have better awareness about the use of contraceptive methods than their rural counterparts Our study observes that the influence of the use of contraceptive

method on fertility is negligible in both residential areas for Hindu women. However, the sign of the path coefficient is in expected direction.

Therefore, to arrest the problem of growing numbers of people in the country there is imperative urgency for improving not only children's chances of survival and raising female age at marriage irrespective of religions but also on programme and policies that encourage eligible couples to increase the use of contraceptive methods.

Table-5 1 : Effects of variables used in the path model (Hindu) for explaining fertility of currently married women

dependent variable	predeter -mined variable	direct effect	Indirect effects through FAM	NLC	DAC	COM	total effect	zero order correlation
CEB	HYS	0 0269 (0 006)	-0 0205	-0 2438	-0 0104	-0 0070	-0 2548	-0 289
	WYS	-0 0549* (0 006)	-0 0218	-0 2548	-0 0141	-0 0109	-0 3565	-0 339
	FAM	-0 0922* (0 006)	-	-0 1278	-0 0010	-0 0031	-0 2241	-0 232
	NLC	0 8580* (0 017)	-	-	0 0394	-0 0068	0 8906	0 913
	DAC	-0 0752* (0 069)	-	-	-	0 0173	-0 0579	-0 516
	COM	-0 0291 (0 0615)	-	-	-	-	-0 0291	0 193

* Significant at P<0 001,
the variable SNLI is removed by backward stepwise regression and $R^2 = 0\ 849$

Table-5 2 : Effects of variables used in the path model (Muslim) for explaining fertility of currently married women

dependent variable	predeter -mined variable	direct effect	Indirect effects through FAM	NLC	DAC	COM	total effect	zero order correlation
CEB	HYS	-0 0590 (0 009)	-0 0129	-0 2014	-0 0271	-0 0272	-0 3276	-0 376
	WYS	-0 0669 (0 011)	-0 0136	-0 2226	-0 0296	-0 0433	-0 3760	-0 418
	FAM	-0 0604* (0 008)	-	-0 1196	-0 0022	-0 0105	-0 1927	-0 221
	NLC	0 7570* (0 024)	-	-	0 0634	-0 0053	0 8151	0 860
	DAC	-0 1190* (0 116)	-	-	-	0 0315	-0 0875	-0 523
	COM	-0 0822* (0 092)	-	-	-	-	-0 0822	-0 051

* Significant at P<0 001,
the variable SNLI is removed by backward stepwise regression and $R^2 = 0\ 782$

Table-5 3: Effects of variables used in the path model(urban-Hindu) for explaining fertility of currently married women

dependent variable	predetermined variable	direct effect	Indirect effects through					total effect	zero order correlation
			FAM	SNLI	NLC	DAC	COM		
CEB	WYS	0 0763* (0 009)	0 021	0 0175	-0 2716	-0 0098	-0 0033	-0 3675	-0 368
	FAM	-0 102* (0 007)	-	0 0051	-0 1254	0 0002	-0 0016	-0 2237	-0 242
	SNLI	0 0215 (0 138)	-	-	-0 2552	-0 0070	-0 0010	-0 2387	-0 314
	NLC	0 865* (0 026)	-	-	-	0 0325	-0 0058	0 8917	0 924
	DAC	-0 0625 (0 092)	-	-	-	-	0 0130	-0 0495	-0 509
	COM	-0 0168 (0 085)	-	-	-	-	-	-0 0168	0 308

* Significant at P<0 001,
the variable HYS is removed by backward stepwise regression and $R^2 = 0\ 871$

Table-5 4: Effects of variables used in the path model (urban-Muslim) for explaining fertility of currently married women

dependent variable	predetermined variable	direct effect	Indirect effects through					total effect	zero order correlation
			FAM	SNLI	NLC	DAC	COM		
CEB	WYS	-0 0759* (0 013)	0 0106	0 0281	-0 1374	-0 0269	-0 0485	-0 2241	-0 273
	FAM	-0 0506 (0 009)	-	0 0061	-0 0936	0 0063	-0 0199	-0 1517	-0 167
	SNLI	0 0111 (0 208)	-	-	-0 1292	-0 0292	-0 0135	-0 1278	-0 183
	NLC	0 9280* (0 028)	-	-	-	0 0942	-0 0414	0 8808	0 892
	DAC	-0 167* (0 134)	-	-	-	-	0 0852	0 0818	-0 552
	COM	-0 134* (0 117)	-	-	-	-	-	-0 1340	0 198

* Significant at P<0 001,
the variable HYS is removed by backward stepwise regression and $R^2 = 0\ 826$

Table- 5 5: Effects of variables used in the path model (rural-Muslim) for explaining fertility of currently married women

dependent variable	predetermined variable	direct effect	Indirect effects through				total effect	zero order correlation
			FAM	SNLI	NLC	DAC		
CEB	HYS	-0 0908* (0 014)	-0 0100	-0 0371	-0 0786	-0 0093	-0 2258	-0 260
	WYS	-0 0552 (0 020)	-0 0108	-0 0618	-0 1538	-0 0097	-0 2913	-0 348
	FAM	-0 0791* (0 014)	-	-0 0047	-0 1004	-0 0015	-0 1857	-0 205
	SNLI	-0 0974* (0 318)	-	-	-0 0518	-0 0012	-0 1504	-0 224
	NLC	0 7220* (0 039)	-	-	-	0 0325	0 7545	0 794
	DAC	-0 0820* (0 208)	-	-	-	-	-0 0820	-0 388

* Significant at P<0 001,
the variable COM is removed by backward stepwise regression and $R^2 = 0\ 686$

Table-5 6: Effects of variables used in the path model (rural-Hindu) for explaining fertility of currently married women

dependent variable	predetermined variable	direct effect	Indirect effects through				total effect	zero order correlation
			FAM	NLC	DAC	COM		
CEB	HYS	0 0762* (0 010)	-0 0079	-0 2104	-0 0066	-0 0083	-0 1570	-0 174
	WYS	-0 0372 (0 012)	-0 0086	-0 1186	-0 0098	-0 0186	-0 1928	-0 158
	FAM	-0 0815* (0 009)	-	-0 0780	0 0016	-0 0021	-0 1603	-0 157
	NLC	0 8660* (0 028)	-	-	0 0414	-0 0058	0 9016	0 896
	DAC	-0 0820* (0 110)	-	-	-	0 0135	-0 0685	-0 503
	COM	-0 0327 (0 101)	-	-	-	-	-0 0327	0 147

* Significant at P<0 001,
the variable SNLI is removed by backward stepwise regression and $R^2 = 0\ 817$

Table-5.7: Number of individual during reference period by different characterestics.

Variables	Characterestics	Number of individual
HYS	0 years	203
	1-10 years	746
	11-15 years	541
	15+ years	198
HOC	Employed	823
	Unemployed	865
HRS	Rural	760
	Urban	928
FAM	-18 years	517
	18-21 years	648
	21+ years	523
WYS	0 years	417
	1-10 years	867
	11-15 years	340
	15+ years	64
NLC	0	153
	1-3	1146
	3+	389
DAC	Yes	400
	No	1288
COM	Ever used	803
	Never used	885
CEB	0-2	765
	3-4	600
	4+	323
WOC	Employed	666
	Unemployed	1022

Chapter-6

MULTIPLE REGRESSION ANALYSIS OF SELECTED SOCIO-DEMOGRAPHIC VARIABLES ON FERTILITY BY AGE GROUP

6.1 Introduction

In our study it is found that the most significant variables, which affect fertility, are (i) age at marriage of the female, (ii) years of schooling of the female, (iii) number of children dead and (iv) use of contraceptive methods by a currently married woman

Sinha (1987) has noticed that those women (40-49 age group) who completed their family size had an average of 4 9 living children Those who married between 17-19 years of age had an average of 5 4 living children as compared to 4 7 living children among those who married after the age of 19 Kadi (1987) observed that- 'an increase in the age at marriage or decline in the proportion of ever married women in a certain age group is an important factor in the decline of fertility' According to Kim (1965) the birth rate in Korea declined 19 5 percent because of an increase in female age at marriage from 16 to 21 3 in 1960 Kim Mo-Im et al (1974) also observed that age at marriage was the most important factor in explaining fertility decline among the currently married Korean women aged 40-49 years during the past two decades It is, therefore, hypothesized that higher the proportion of currently married women in an age above 20, lower is the fertility

Researchers [Caldwell (1981), Birdsall (1977)] have cited that education is the single most important variable leading to large-scale fertility decline In fertility studies, education is generally recognized to be the best single indicator of individual modernity [Freedman, Zhenyu, Bohua and Lavey (1988)] It is hypothesized that the higher the level of couple's education in an age group, the lower is the fertility

Pathak and Murthy (1985) have claimed that infant mortality and fertility have a positive correlation Parmar (1990) has shown that a woman who had not suffered any child loss or had lost only one child produced the least number of children with an average of 3 6 Further, the average number of children increased to 6 4 in the case of currently married women who had lost two or three infants This indicates that a higher level of child loss results in a higher fertility and vice-versa Based on this assumption, it is hypothesized that the higher the level of child loss in a reproductive age group, the higher is the fertility from that age group

The age pattern of contraceptive user indicates that every young woman tend to use contraception if she has achieved her desired family size The NFHS-1 (1992-93) study of India shows that contraceptive use rate is highest in the age group (30-39), whereas a very low use rate is observed among currently married women of age less than 20 The age pattern of ever use of any modern contraceptive method is peaking in the age group (35-39) It is hypothesized that the higher the proportion of currently married women who have ever used contraceptive method in an age group, the lower is the fertility from that age group

The present study relates to a multiple linear regression analysis of fertility behaviour of currently married women in six age groups, i e (15-24, 25-29, 30-34, 35-39, 40-44 and 45-49) More specifically, we intend to examine the net and joint effect of socio-demographic factors on fertility behaviour of currently

married women in different reproductive age groups of 15 districts of Assam by using NFHS-1(1992-93) data. The inter age group variation in fertility is examined in relation to certain aspects of female status, survival status and ever-use of contraceptive method by currently married women (COM). Female status is measured in terms of age at first marriage (FAM) and wife's formal years of schooling (WYS). Number of children dead (NCD) determines the survivorship status of children. The number of children ever born (CEB) to each reproductive age group of currently married women is used as a measure of fertility. Here NCD refers to the five years period immediately preceding the survey, i.e. 1988-93.

A few numbers of live births in the age group (15-19) has hindered its study as a separate group. So, for the sake of convenience, it is combined with the group (20-24) to get the group (15-24).

6.2 Analysis

A look at the correlation coefficient (Table-6.1) immediately leads to confirm the hypothesized relationship between fertility behaviour on female status and survival status. FAM shows a negative relationship with fertility, i.e. the higher the proportion of women marrying in late age, more specifically above 20 years; the lower is the fertility. This relationship between fertility and FAM is found to be statistically significant in all the reproductive age groups. The sign of the correlation coefficient in between fertility and wife's years of schooling agrees with general expectations, i.e. the higher the level of female education in an age group after 30 years of age, the lower is the fertility. The fluctuations observed among the age groups (15-24, 25-29) could be the result of a possible bias in the reporting of wife's educational level. Further, there is a positive relationship between child loss and fertility in all the age groups except the age group (15-24). Thus higher the level of child loss in an age group, higher is the fertility. This relationship is found to be statistically significant in all reproductive age groups.

Table-6 1 Zero-order (pearsonian) correlation coefficients between CEB and FAM, WYS, NCD and COM

Age group	FAM	WYS	NCD	COM
15-24	-0 393*	0 499	-0 367	0 493*
25-29	-0 420*	-0 040	-0 041	0 518*
30-34	-0 248*	-0 300	0 006	0 377
35-39	-0 067*	-0 387*	0 215*	0 323
40-44	-0 134*	-0 225*	0 524*	0 212*
45-49	-0 178*	-0 239*	0 524*	0 303*

Note * Significant at 0 05 level

The ever use of contraceptive method by currently married women (COM) shows a negative association with fertility in the age groups (15-24, 25-29, 40-44 and 45-49), i e the higher the proportion of currently married women who are aware about the use of contraceptive method in a reproductive age group, the lower is the fertility from that age group The direction of the association has turned out to be consistent with general expectations except the age groups (30-34) and (35-39) The relationship is not found to be statistically significant in the more fertile reproductive age groups (30-34) and (35-39)

In order to measure the net effect of independent variables on fertility (dependent variable) multiple regression technique was used The functional form of the equation employed to measure the effects of the independent variables on fertility is as follows

$$(CEB)_j = b_0 + b_1 (FAM)_j + b_2 (WYS)_j + b_3 (NCD)_j + b_4 (COM)_j + e_j \qquad (6\,2\,1)$$

Here j ranges from 1 to 1688 currently married women
b_0 b_1, b_2, b_3, b_4 are regression coefficients and e_j denotes error term

Table-6.2: Regression analysis of fertility for Hindu women

Variable	coefficient	std.error	t	P
Constant	3.671	0.255	14.412	<0.001
FAM	-0.0450	0.0122	-3.683	<0.001
WYS	-0.129	0.00940	-13.756	<0.001
NCD	0.793	0.0670	11.846	<0.001
COM	1.132	0.0862	13.124	<0.001

Analysis of Variance:

	DF	SS	MS	F	P
Regression	4	764.486	191.121	129.049	<0.001
Residual	923	1366.961	1.481		
Total	927	2131.447			

Table-6.3: Regression analysis of fertility for Muslim women

Variable	coefficient	std.error	t	P
Constant	4.201	0.278	15.089	<0.001
FAM	-0.0465	0.0138	-3.360	<0.001
WYS	-0.152	0.0131	-11.598	<0.001
NCD	0.752	0.0603	12.472	<0.001
COM	0.931	0.122	7.622	<0.001

Analysis of Variance:

	DF	SS	MS	F	P
Regression	4	867.024	216.756	107.816	<0.001
Residual	755	1517.876	2.010		
Total	759	2384.900			

Table-6.4: Regression analysis of fertility for combined Hindu and Muslim women

Variable	coefficient	std.error	t	P
Constant	3.964	0.188	21.064	<0.001
FAM	-0.0478	0.00917	-5.208	<0.001
WYS	-0.143	0.00771	-18.550	<0.001
NCD	0.809	0.0433	18.657	<0.001
COM	1.050	0.0719	14.617	<0.001

Analysis of Variance:

	DF	SS	MS	F	P
Regression	4	1848.013	462.003	265.889	<0.001
Residual	1683	2924.345	1.738		
Total	1687	4772.358			

While assessing the net effect of independent variables on fertility, we have selected only those variables that are strongly related to fertility and are least inter correlated among them This is to arrive at the true effect of the independent variables by minimizing the influence of multi-collinearity among the independent variables Under the above selection criteria, here we have considered only four independent variables-FAM, WYS, NCD and COM

The regression model (6 2 1) for currently married women of Hindu, Muslim and combined group of both Hindu and Muslim women are shown below in order

CEB = 3 671* - (0 0450* FAM) - (0 129* WYS) + (0 793* NCD) + (1 132* COM) (6 2 2)

CEB = 4 201*- (0 0465* FAM) - (0 152* WYS) + (0 752* NCD) + (0 931*COM) (6 2 3)

CEB = 3 964*- (0 0478* FAM) - (0 143* WYS) + (0 809* NCD) + (1 050* COM) (6 2 4)

(* denotes significant at 'p <0 001' level)

The results (Table-6 2, 6 3 and 6 4) of the regression analysis confirm that all the four independent variables FAM, WYS, NCD and COM are statistically significant for Hindu women (6 2 2), Muslim women (6 2 3) and combined group of Hindu and Muslim women (6 2 4)

The results (Table-6 5) of the regression analysis also confirm the earlier conclusion based on zero-order correlation (Table-6 1) that FAM and NCD are most dominant demographic variables affecting fertility in the reproductive age groups of currently married women The sign of regression coefficients are consistent with the general expectations The negative impact of FAM on fertility is found to be prominent and statistically significant, particularly in the highly fertile reproductive cycle (25-39), while NCD is found to influence fertility behaviour of the currently married women in their reproductive period (25-49)

Table-6 5 Regression analysis of fertility by women reproductive age groups

Age group	Values	Constant	FAM	WYS	NCD	COM
15-24	Coefficient	4 386	-0 153	0 013	0 612	-0 652
	Std error	2 778	0 166	0 065	0 231	0 516
	t	1 579	-0 922	3 238	2 645	-1 263
	P	0 128	0 366	0 004	0 014	0 219
25-29	Coefficient	6 835	-0 224	0 023	0 796	0 534
	Std error	0 745	0 041	0 061	0 104	0 333
	t	9 175	-5 468	0 381	7 636	1 602
	P	<0 001	<0 001	0 704	<0 001	0 111
30-34	Coefficient	5 482	-0 101	-0 216	0 782	0 789
	Std error	0 402	0 019	0 026	0 077	0 173
	t	13 641	-5 404	-8 295	10 060	4 570
	P	<0 001	<0 001	<0 001	<0 001	<0 001
35-39	Coefficient	4 958	-0 049	-0 296	0 652	1 409
	Std error	0 453	0 016	0 028	0 084	0 139
	t	10 956	-3 085	-10 625	7 749	10 151
	P	<0 001	<0 001	<0 001	<0 001	<0 001
40-44	Coefficient	2 647	-0 0324	-0 071	0 553	1 449
	Std error	0 495	0 018	0 035	0 119	0 125
	t	5 343	-1 806	-2 041	4 635	11 559
	P	<0 001	0 072	0 042	<0 001	<0 001
45-49	Coefficient	3 070	-0 044	-0 082	0 785	1 328
	Std error	0 703	0 024	0 045	0 154	0 139
	t	4 369	-1 848	-1 838	5 096	9 534
	P	<0 001	0 066	0 067	<0 001	<0 001

Further, a perusal of Table-6 5 reveals that the impact of the demographic variables FAM and WYS on fertility is not found to be statistically significant in the later stage of reproductive periods, particularly after 40 years However, both the variables have significant effects on fertility in the more fertile reproductive age groups (30-34) and (35-39) The other two demographic variables NCD and COM have been found to be statistically significant in all the reproductive ages after 30 years

The linear regression model considered here explains 40-60 percent of the variation in fertility (CEB) behaviour of the currently married women in their reproductive periods The joint effects (by studying analysis of variance table) of the NCD, FAM, WYS and COM on CEB are found to be statistically significant in all the reproductive age groups

6.3 Discussion and Conclusion

The purpose of this paper has been to study the inter-reproductive age variation in fertility in relation to certain aspects of female status (FAM, WYS), survival status of children (NCD) and COM Of these three variables, female status emerges as the single most important factor explaining inter-age variation in fertility The higher the proportion of currently married women aged above 25 years in a particular age group, the lower is the fertility from that age group An increase in female education at the individual level is associated with a decrease in their fertility but its magnitudes vary in the current age groups The effect of education of women on fertility is more pronounced after 30 years of age

The impact of NCD on fertility is statistically significant for currently married women beyond the age of 25 years Survival of children turns out to be the second important aspect affecting fertility The lower the chance of survival of a child (in other words, the higher the infant/child mortality), the higher is the fertility rate

COM is the third important factor explaining inter-age variation in fertility. The higher the proportion of currently married women who are aware of the use of any contraceptive method in an age group, the lower is the fertility from that age group.

The impact of female status, survival status of children and the use of contraception on fertility is slightly higher in the more fertile reproductive age groups (30-34) and (35-39). In all the reproductive ages female age at marriage and survival status of children are considered to be the most important factors in reduction of fertility.

The study, although limited in scope, clearly points to the need of improving children's chances of survival, raising female age at marriage and increasing use of contraceptive method, which will go a long way in the reduction of fertility.

Chapter-7

CONCLUSION

The study is an analysis of the differences in the fertility and contraceptive behaviour and their socio-economic and demographic correlates among the followers of two major religions- Hinduism and Islam. The main findings of the investigation may be summarized as follows:

Irrespective of the religions, educated women are relatively more homogenous than the uneducated ones with regard to the average number of children ever born. Female education shows a significant negative association with fertility and it shows a more depressing effect upon fertility than male education. The negative effects of female education on additional desired fertility have been observed all through the reproductive career. Our results reveal that females having an average of 37 years of age with atleast 7 years of schooling have a lesser demand for having additional children. Higher female education leads to a late marriage with the result of less number of children ever born. Educated women are less likely to desire for future birth, causing decline in fertility.

An inverse relationship between age at marriage and fertility is found to exist irrespective of whether an age cohort estimate or an average of all the age cohorts was examined. A negative trend between age at marriage and fertility in both the Hindu and Muslim religions are established from the estimates. It is found that 21 and 19 are the critical ages at marriage for Hindu and Muslim women respectively. The critical age at marriage indicates the direction of the interrelationship between fertility and age at marriage. This age factor has an

opposite indirect effect on children ever born through number of living children, desire for additional children and ever use of any contraceptive method in Muslim religions of rural areas and as a whole Although child mortality is declining slowly in Assam, it still plays an important role in predicting fertility From the study it is observed that the women having no experience of child loss or suffering the loss of only one child gave birth to 2 7 numbers of children on the average, while it increased to 5 02 in the case of women who had the experience of loss of atleast two children So child mortality has a significant positive effect on fertility Women of high standard of living have on the average 0 71 fewer live births than their counterparts having low standard of living A negative association between standard of living index and the fertility behaviour of women has been observed in the study (Chapter-2)

Preference for sons over daughters was also reflected in our data through average number of children ever born Craving for additional children in Hindus is about 1½ times more on the average than of the Muslims A negative trend between number of living sons and fertility has been noticed after achieving one living son in both the religions However, the rate of increase of fertility with respect to number of living daughters is not declining fast in both the religions The analysis indicates that the depressing effect of the number of surviving sons on the mean number of children ever born is much larger than the effect of the number of surviving daughters (Chapter-3)

The contraceptive use rate was found to be positively associated with number of living children and respondent's duration of marriage The couple's educational level seems to have a positive effect on the ever use of contraception As expected, education helps to increase awareness and use of contraception Women whose level of education was of a longer duration were more likely to be using contraceptive than women having shorter duration of education The impact of couples' desire for additional children on the ever use of contraceptive method

was in opposite direction as expected Women of affluent society with modern amenities in their households are more likely to practise contraception Urban areas show high rates of contraceptive use in comparison to rural areas Preference for sons has been observed to have a substantial impact on contraceptive behaviour all through the reproductive period This study indicates that couples that have only daughters are less likely to use contraceptive methods than their counterparts who have atleast one son in addition to daughters Experience of a child loss is not a significant predictor of contraceptive use although the association is in the expected directions (Chapter-4)

The study suggests that educational status of wife is expected to induce delaying of age at marriage, higher standard of living and awareness about the use of contraceptive method The impact of education on age at marriage, desire for additional children and on the use of contraceptive methods of Muslim women is higher than that of their Hindu counterparts Providing formal education to female can raise their age at marriage and this will help depress the level of fertility The impact of women education in reducing fertility is more pronounced for Hindu women as compared to their Muslim counterparts In rural areas, the influence of wife's education on fertility finds little importance in both the religions, but in urban areas this is not always true Even then, the negative effects of education on fertility are widely prevalent in rural areas So, advancement in female education is expected to influence fertility behaviour even without simultaneous changes in other factors On the basis of the findings, it may be suggested that attention should be focused on the need for providing education facilities, particularly for Muslim women in rural areas, in order to depress the level of fertility in Assam It has been observed that an experience of child loss is associated with higher likelihood of having subsequent births, i e an increase in the number of child loss leads to an increase in live births to mothers irrespective of religion (Hindu & Muslim) In order to lower the fertility rates, child deaths

must be reduced. Son preference plays a significant impact on additional desired fertility and contraceptive practices. One surviving son turns out to be the threshold number beyond which the desire for additional children declines fast. This suggests that if the desired number of sons is achieved in the first birth, then it affects negatively the desire for additional children. Although, a skewed distribution of son preference over fertility has been noticed in both the religions, if equal education for daughters and sons were provided, then it may be possible to lower the level of children born during the reproductive period of women. Female education has a high influence on the decrease in their fertility, particularly after 30 years of age. A negative effect of contraceptive use on fertility indicates an increased level of contraceptive use and its effectiveness in Assamese society. The impact of standard of living index on fertility for Muslim women is more pronounced in urban areas than rural areas. It is observed that rural-Hindu women have more children ever born to them as compared to their urban-Hindu counterparts (Chapter-5).

The higher the proportion of currently married women aged above 25 years in a particular age group, the lower is the fertility from that age group. The impact of age at marriage of female on fertility is more pronounced in the high fertility reproductive ages (30-39). Female education has a high influence on the decrease in their fertility, particularly after 30 years of age. The impact of use of contraception on fertility is higher in the more fertile reproductive age groups (30-34) and (35-39). The lower the chance of survival of a child in a reproductive age group, the higher is the fertility rate from that age group (Chapter-6).

To conclude, education is found to be an important instrument through which fertility behaviour can be changed in the long run. The decline in fertility could be achieved through rising educational levels, lower mortality of children and other social changes. However, it is not credible that these changes could have produced such rapid declines in a short time-period without the influence of

increasing the usage of contraception and encouraging higher levels of education and lowering the rate of child mortality, further reduction of fertility can be achieved. This study established a negative trend between age at marriage and fertility in both the Hindu and Muslim religions. It is also suggested that attention should be focused on the need for enlarging educational facilities to women, and particularly to Muslim women in rural areas of Assam.

The findings have important policy implications- higher the level of couple's education and its socio-economic status, smaller is their family size, leading to more effective use of contraceptives.

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